MacBook Pro (14-inch, 2021)

Repair Manual

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Introduction

This manual includes technical instructions for replacing genuine Apple parts in Mac and is intended for individual technicians with the knowledge, experience, and tools required to repair electronic devices.

Important

- Read the entire manual first. If you're not comfortable performing the repairs as instructed in this manual, don't proceed.
- Always use the latest version of this document available at support.apple.com/en_US/manuals/mac+repair+manual.

Warning

Failure to follow the repair instructions or to use genuine Apple parts or proper tools may cause fire or other safety issues and lead to personal injury or death.

Caution

Failure to follow the repair instructions or to use genuine Apple parts or proper tools may damage the Mac, parts, or other property, or compromise the device's functionality.

Warranty information

Damage caused by repairs performed outside of Apple or the Apple Authorized Service Provider network is not covered by Apple's warranty or AppleCare plans. Such damage may cause future repairs to be subject to out-of-warranty costs or render the device ineligible for future repairs by Apple or Apple Authorized Service Providers.

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Tools and parts

Ordering tools and parts

You can learn how to order genuine Apple parts and tools at support.apple.com/self-service-repair. During the purchase process, enter the manual ID **BQEZWU** to indicate that you've read this manual in its entirety and agree that you have the knowledge and experience to perform your intended repair.

Software tools

Apple Diagnostics can check your Mac for hardware issues.

A System Configuration step may be required at the end of your repair. System Configuration is a postrepair software tool that completes the repair for genuine Apple parts. Running System Configuration has a number of purposes that vary based on the part replaced.

What System Configuration does	Why it's important
Updates replacement logic board with device serial number	Replacement logic boards must be updated with your device's serial number to ensure that Apple Pay, FaceTime, iMessage, and iCloud services, such as Find My, can communicate safely and securely with your device.
Transfers factory calibration values	Certain parts like displays, cameras, and ambient light sensors have calibration values that are customized to each individual part during manufacturing. Transferring these values ensures maximum performance and quality after a repair.
Links Secure Enclave and biometric authentication parts	After repair of a logic board or a biometric authentication part (Touch ID), linking the biometric sensors to the Secure Enclave on the logic board is required to ensure device security.
Ensures repair integrity	After a hardware repair, software checks are performed to ensure repair integrity. Repair integrity means that a genuine Apple part has been correctly installed.
Assigns wireless region	To comply with regional communications regulations, a wireless region must be assigned to your logic board.
Updates firmware	Keeping firmware up to date ensures that the device has all the latest security and performance features.

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System Configuration requires a strong Wi-Fi network capable of 1.0 Mbps download and upload speeds, with less than 400 ms latency and less than 2% packet loss. Estimated data usage to run System Configuration is 6–22 MB.

The device must be running the latest version of macOS and not a beta version.

Learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

Alerts

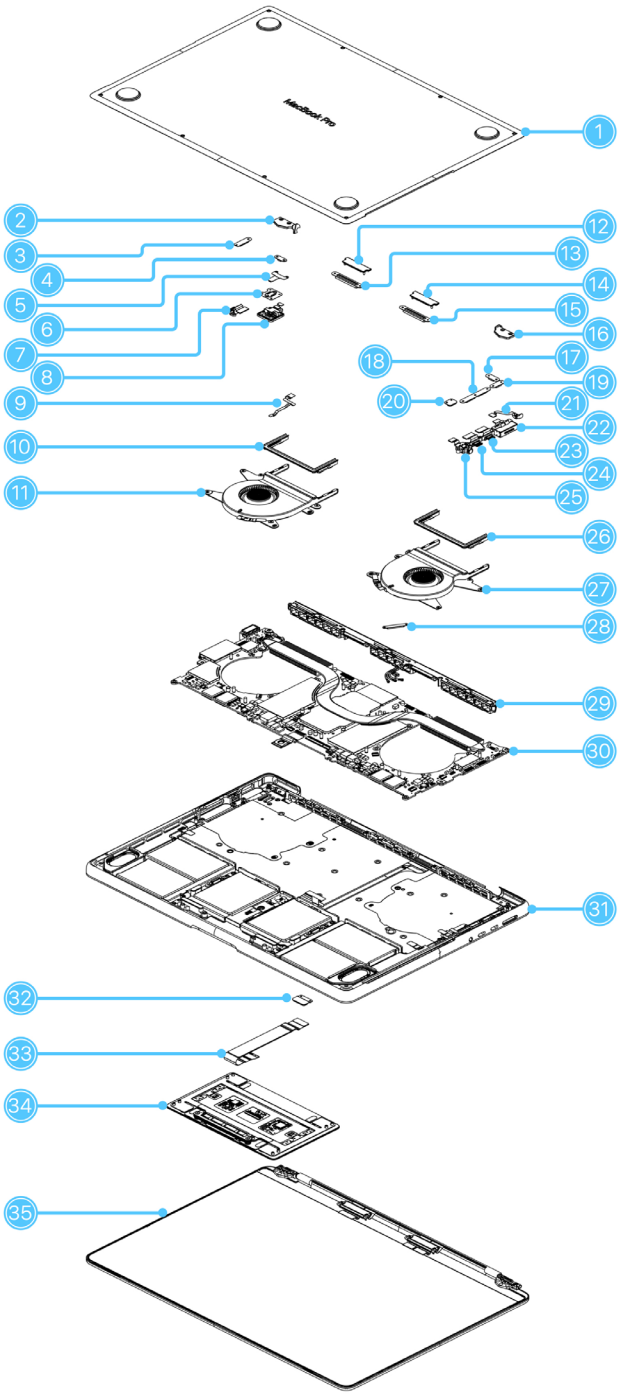
Failure to follow alerts could result in fire, injury, data loss, or damage to the device, parts, or other property.

 **Danger**	Instructions for reducing risk of electric shock and electrocution
 **Warning**	Instructions for reducing risk of personal injury
 **Caution**	Instructions for reducing risk of data loss or device hardware damage
Important	Supplemental information for successfully completing procedures; neither a Warning nor a Caution

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Exploded View and Orderable Parts

This section shows parts, part names, and part numbers for MacBook Pro (14-inch, 2021).



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Part Name	Number
1. Bottom case	923-06702, space gray 923-06703, silver
2. Right display hinge cover	923-06761, space gray 923-06762, silver
3. Right USB-C board connector cowling	923-07050
4. Touch ID board connector cowling	923-07046
5. Touch ID board Y-shaped cowling	923-06939
6. Touch ID board flexible cowling	923-07048
7. USB-C board	923-06760
8. Touch ID board	661-23549
9. Battery management unit (BMU) flex cable	923-06765
10. Right fan duct	923-07045
11. Right fan	923-06778
12. Display cable bumper	923-06887
13. Display connector cowling	923-07047
14. Display cable bumper	923-06887
15. Display connector cowling	923-07047
16. Left display hinge cover	923-06763, space gray 923-06764, silver
17. Lid angle sensor connector cowling	923-06888
18. Left USB-C boards connector cowling	923-06892
19. MagSafe 3 board connector cowling	923-06889
20. Audio board connector cowling	923-07014
21. Lid angle sensor	661-23649
22. MagSafe 3 board	923-06870, space gray 923-06871, silver
23. USB-C board	923-06760
24. USB-C board	923-06760
25. Audio board	923-06757
26. Left fan duct	923-06933
27. Left fan	923-06759

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Part Name	Number
28. Antenna coaxial cable connector cowling	923-06890
29. Vent/antenna module	923-06758
30. Logic board	661-21255, 8-core CPU, 14-core GPU, 16 GB, 512 GB 661-21256, 8-core CPU, 14-core GPU, 16 GB, 1 TB 661-21257 8-core CPU, 14-core GPU, 16 GB, 2 TB 661-21258, 8-core CPU, 14-core GPU, 16 GB, 4 TB 661-21259, 8-core CPU, 14-core GPU, 16 GB, 8 TB 661-21260, 8-core CPU, 14-core GPU, 32 GB, 512 GB 661-21261, 8-core CPU, 14-core GPU, 32 GB, 1 TB 661-21262, 8-core CPU, 14-core GPU, 32 GB, 2 TB 661-21263, 8-core CPU, 14-core GPU, 32 GB, 4 TB 661-21264, 8-core CPU, 14-core GPU, 32 GB, 8 TB 661-21265, 10-core CPU, 14-core GPU, 16 GB, 512 GB 661-21266, 10-core CPU, 14-core GPU, 16 GB, 1 TB 661-21267, 10-core CPU, 14-core GPU, 16 GB, 2 TB 661-21268, 10-core CPU, 14-core GPU, 16 GB, 4 TB 661-21269, 10-core CPU, 14-core GPU, 16 GB, 8 TB 661-21270, 10-core CPU, 14-core GPU, 32GB, 512GB 661-21271, 10-core CPU, 14-core GPU, 32 GB, 1 TB 661-21272, 10-core CPU, 14-core GPU, 32 GB, 2 TB 661-21273, 10-core CPU, 14-core GPU, 32 GB, 4 TB 661-21274, 10-core CPU, 14-core GPU, 32 GB, 8 TB 661-21275, 10-core CPU, 16-core GPU, 16 GB, 512 GB 661-21276, 10-core CPU, 16-core GPU, 16 GB, 1 TB 661-21277, 10-core CPU, 16-core GPU, 16 GB, 2 TB 661-21278, 10-core CPU, 16-core GPU, 16 GB, 4 TB 661-21279, 10-core CPU, 16-core GPU, 16 GB, 8 TB 661-21280, 10-core CPU, 16-core GPU, 32 GB, 512GB 661-21281, 10-core CPU, 16-core GPU, 32 GB, 1 TB 661-21282, 10-core CPU, 16-core GPU, 32 GB, 2 TB 661-21283, 10-core CPU, 16-core GPU, 32 GB, 4 TB 661-21284, 10-core CPU, 16-core GPU, 32 GB, 8 TB 661-21285, 10-core CPU, 24-core GPU, 32 GB, 512 GB 661-21286, 10-core CPU, 24-core GPU, 32 GB, 1 TB 661-21287, 10-core CPU, 24-core GPU, 32 GB, 2 TB 661-21288, 10-core CPU, 24-core GPU, 32 GB, 4 TB 661-21289, 10-core CPU, 24-core GPU, 32 GB, 8 TB 661-21290, 10-core CPU, 24-core GPU, 64 GB, 512 GB 661-21291, 10-core CPU, 24-core GPU, 64 GB, 1 TB 661-21292, 10-core CPU, 24-core GPU, 64 GB, 2 TB 661-21293, 10-core CPU, 24-core GPU, 64 GB, 4 TB 661-21294, 10-core CPU, 24-core GPU, 64 GB, 8 TB 661-21295, 10-core CPU, 32-core GPU, 32 GB, 512 GB 661-21296, 10-core CPU, 32-core GPU, 32 GB, 1 TB 661-21297, 10-core CPU, 32-core GPU, 32 GB, 2 TB 661-21298, 10-core CPU, 32-core GPU, 32 GB, 4 TB 661-21299, 10-core CPU, 32-core GPU, 32 GB, 8 TB 661-21300, 10-core CPU, 32-core GPU, 64 GB, 512 GB

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Part Name	Number
30. Logic board (continued)	661-21301, 10-core CPU, 32-core GPU, 64 GB, 1 TB 661-21302, 10-core CPU, 32-core GPU, 64 GB, 2 TB 661-21303, 10-core CPU, 32-core GPU, 64 GB, 4 TB 661-21304, 10-core CPU, 32-core GPU, 64 GB, 8 TB
31. Top case with battery and keyboard Read the Important alert below to ensure that you order the correct top case.	661-21972, space gray 661-21973, silver
32. Trackpad connector cowling	923-06891
33. Trackpad flex cable	included with a replacement trackpad
34. Trackpad	661-23551, space gray 661-23552, silver
35. Display	661-21970, space gray 661-21971, silver

Important

The English (US) top case part number begins with 661. Other regional top case part numbers also begin with 661, but they include a language prefix. For example, the Italian top case part number begins with T661. To determine the correct language prefix, identify your keyboard language by country or region. Then identify the correct country code from the language prefix list below:

AB	Arabic	GR	Greek	RS	Russian
B	British	H	Norwegian Bokmal	S	Swedish
BG	Bulgarian	HB	Israeli	SF	Swiss French
C	Canadian French	IS	Icelandic	SL	Slovak
CH	Chinese (Pinyin)	J	Japanese	T	Italian
CR	Croatian	KH	Korean	TA	Chinese (Zhuyin)
CZ	Czech	LA	Latin America	TH	Thai
D	German	MG	Hungarian	TQ	Turkish-Q
DK	Danish	N	Dutch	TU	Turkish-F
E	Western Spanish	PO	Portuguese	Z	English International
F	French	RO	Romanian		

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Screws

Caution

- Save undamaged screws and cowlings for reassembly.
- Note the location of screws and cowlings during removal. Then organize them to ensure that you reinstall them in the correct location.
- Both overtightened screws and loose screws can damage parts.

923-06849
Torx® T5

BMU (1)



923-06850
Torx T5

Vent/antenna module, corners (2)



923-06851
Torx T3

Antenna coaxial cable cowling (2)

Antenna coaxial cable grounding clip (1)

Trackpad flex cable cowling (2)



923-06852
1IPR

Lid angle sensor flex cable clip (1)



923-06853
Torx T5

Display hinge covers (4)



923-06854
Torx T3

Audio board connector cowling (2)

Display connector cowlings (4)

Lid angle sensor connector cowling (2)

MagSafe 3 board connector cowling (2)

USB-C board connector cowlings (5)



923-06866
Pentalobe

Bottom case, front, silver (4)



923-06867
Pentalobe

Bottom case, rear, silver (4)



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923-06868
Pentalobe

Bottom case, front, space gray (4)



923-06869
Pentalobe

Bottom case, rear, space gray (4)



923-06928
Torx Plus 2IP

MagSafe 3 set screws (2)



923-06929
Torx T5

Fan (2)



923-06930
Torx T3

Fan (1)



923-06935
Torx T3

Fan (5)



923-06936
Torx T5

Audio board, short (1)



923-06937
Torx T5

Audio board, long (1)



923-06938
Torx T5

USB-C boards (6)



923-06940
Torx T3

Touch ID board Y-shaped cowling (2)



923-06941
Torx T5

Trackpad (10)



923-06942
Torx T3

Touch ID board flexible cowling, center (2)



923-06955
Torx T3

Touch ID board flexible cowling, outer (4)



923-06959
Torx T5

MagSafe 3 board (2)



923-07032
Torx T5

Vent/antenna module, middle (4)



923-07033
1IPR

Vent/antenna module (9)



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923-07035
Torx T6

Logic board, top corners (2)



923-07036
Torx T6

Logic board, SDXC (1)



923-07037
Torx T5

Logic board, bottom corners (2)



923-07038
Torx T5

Logic board, bottom center (2)



923-07039
Torx T5

Logic board, center (4)



923-07040
Torx T5

Logic board (3)



923-07042
Torx T8

Display hinges (6)



923-07046
Torx T3

Touch ID board connector cowling (2)



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Tools

923-07179
4 mm hex nut driver



923-02995
Adjustable torque driver (10–34 Ncm)



923-01322
Antenna tool



923-06086
Battery cover

Microterry polishing cloth



923-01368
Cut-resistant gloves



EarPods with 3.5 mm headphone plug



ESD mat



ESD-safe cleaning solution



ESD-safe tweezers



ESD wrist strap with clip or plug



Fire-proof enclosure



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923-02998
Gap offset kit



Heat-resistant gloves



922-1731
Kapton tape



923-01803
Keycap lever



Magnetizer



Needle-nose pliers



922-5065
Nylon probe (black stick)



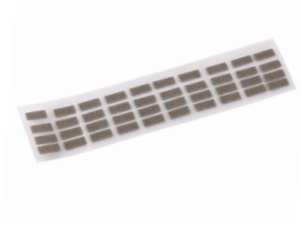
923-0731
Pentalobe screwdriver



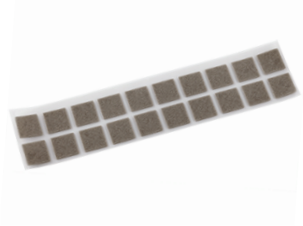
Permanent marker



923-01800
Precut adhesive strips (1x0.5)



923-01801
Precut adhesive strips (1x1)



Safety glasses with side shields



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Sand[1]



Sand container[2]



Sticky notes (3 by 3 inches)



923-8252
Suction cups



922-0448
Torque driver (blue, 0.65 kgf cm)



923-06752
Torx Plus 2IP 44 mm half-moon bit



923-0247
Torx security bit



923-02996
Torx T5 bit



Torx T3 screwdriver



Torx T5 screwdriver



Torx T6 screwdriver



Torx T8 screwdriver



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923-03032
Touch ID alignment kit

661-06670
USB-C charge cable



661-23656
USB-C to MagSafe 3 cable



[1] Clean, dry, untreated sand (8–10 cups)

[2] Sand container (wide-mouthed, quick pour, nonbreakable plastic container with a flip-top lid)

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Battery Safety

Warning

- This device contains a built-in lithium-ion rechargeable battery with soft battery cells. Battery safety is the number one concern when repairing a device with a built-in lithium-ion battery.
- Only technicians with the knowledge, experience, and tools required to repair electronic devices should replace a battery.
- Improper battery replacement, improper handling of parts, failure to discharge the battery before repair, or failure to follow the provided instructions could cause battery overheating, swelling, venting, leaking, or a battery thermal event. These events could result in fire, injury, death, data loss, or damage to the device, parts, or other property.
- To avoid these potentially harmful events, follow the battery safety guidelines and work in a safety-focused workspace with the tools listed below. It's important to be prepared for all possible outcomes.

How to set up a workspace for battery safety

Tools

- Clean, dry, untreated sand (8–10 cups)
- Sand container (wide-mouthed, quick pour, nonbreakable plastic container with a flip-top lid)
- Heat-resistant gloves
- Safety glasses with side shields
- ESD-safe cleaning solution
- Fireproof enclosure

Workspaces used to repair Apple devices should meet the following criteria:

- Nonflammable and electrostatic discharge (ESD)-safe work bench
- At least 2 feet away from paper and other combustible materials
- Sand container within reach (2 feet) on one side of the workspace, not above the workspace
- Adequate ventilation
- Within 20 feet of a fireproof enclosure. Don't store combustible or flammable materials in the enclosure. Ensure that the enclosure remains empty.

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Warning

How to handle a battery thermal event

A battery thermal event is a rapid chemical chain reaction that occurs inside a battery cell. The energy stored in the battery is released suddenly, which can cause outgassing and fire. A battery thermal event can be triggered by physical damage to the battery, improper replacement or repair, or temperatures outside the battery's operating range.

Act immediately if you notice any of the following signs of a battery thermal event:

- The lithium-ion battery or a device that contains one begins to smoke or emit sparks or soot.
- The battery pouch suddenly and quickly puffs out.
- The lithium-ion battery or a device that contains one begins to emit hissing or popping sounds.

Do smother the battery or device immediately with plenty of clean, dry sand. Dump the sand all at once. Timing is critical — the faster you pour all the sand, the sooner the reaction will be contained.

Do contact local fire authorities if further assistance is needed.

Do leave the room for 30 minutes after the reaction is contained. Ventilate the area. Don't return until the area is clear of smoke.

Do wait 30 minutes before touching the device. Wear the heat-resistant gloves and safety glasses with side shields to remove the device from the sand. Then place the device into the fireproof enclosure. Leave it in the enclosure for at least 2 hours.

Do wipe the affected area with water first. Then wipe the area with an ESD-safe cleaning solution.

Do dispose of the damaged battery or device (including any debris removed from the sand) according to local environmental laws and guidelines.

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How to handle batteries

Discharge the battery

Warning

Fully discharge the battery before you begin a repair. A discharged battery is less susceptible to a battery thermal event. If you can't determine the battery level, don't repair the device.

The following actions will help to discharge the battery:

- Disconnect the power cable.
- Increase display brightness to the highest setting.
- Turn on Wi-Fi and Bluetooth.
- Open the FaceTime app or Photo Booth app to turn on the camera.
- Play a video from the local drive or a streaming service.

Use a battery cover

Avoid damaging the battery by performing the following actions:

- Immediately after removing the bottom case, follow the instructions to attach the battery cover and disconnect the battery from the logic board.
- Always keep the battery cover on the battery when it's exposed.
- Only remove the battery cover immediately before you install the bottom case, unless otherwise instructed.

Best practices

- To avoid noxious fumes or a battery thermal event, don't puncture, strike, or crush a lithium-ion battery or a device that contains one.
- Keep your workspace clear of foreign objects and sharp materials.
- Be careful when using sharp tools near the battery.
- Don't leave loose screws, extra screws, or small parts inside the device.
- Don't use tools that conduct electricity.
- Don't throw or drop the battery.
- Don't expose the battery to excessive heat or sunlight, or temperatures outside the battery's operating range.
- Handle and dispose of waste batteries in accordance with local laws and regulations.

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First Steps

Always perform the following steps before starting a repair:

- Back up the Mac.
- If replacing the logic board or Touch ID board, turn off Find My Mac. Choose Apple Menu > System Preferences > Apple ID. Select iCloud in the sidebar. Then deselect the Find My Mac checkbox. If you're unable to access the Apple menu, continue performing the following steps.
- Discharge the battery fully.
- Turn off the Mac.
- If you were unable to turn off Find My Mac from the Apple menu, go to iCloud.com/find on a different device. Select All Devices. Select the device you want to remove. Then select Remove from Account.
- Unplug the power cable from the electrical outlet. Keep the power cable unplugged while the device is being repaired.
- Disconnect all cables.
- Remove all cases and covers.
- Clear and clean your workspace.
- Put on an ESD wrist strap and attach it to a properly grounded ESD mat.

Caution

ESD (electrostatic discharge, or the release of static electricity) can damage electronic components.

Be aware of the following while performing a repair:

- The manual for this model may show images of other models, but the procedures are the same. Ensure that you use the correct tools for the model you're repairing.
- Take your time. Thoroughly read all instructions and alerts.
- Magnetizing the screwdrivers will make it easier to work with small screws.
- Use only Kapton tape to secure cables and keep them out of the way when removing and reinstalling parts.
- The end of each flex cable must align with its connector. Press the end of each flex cable to its connector until it clicks to ensure that it's secure.

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Warning

Avoid damaging the battery by performing the following actions:

- Immediately after removing the bottom case, follow the instructions to attach the battery cover and disconnect the battery from the logic board.
- Always keep the battery cover on the battery when it's exposed.
- Set aside all parts and screws removed during the repair and account for them at the end of the repair.
- Only remove the battery cover immediately before you install the bottom case, unless otherwise instructed.

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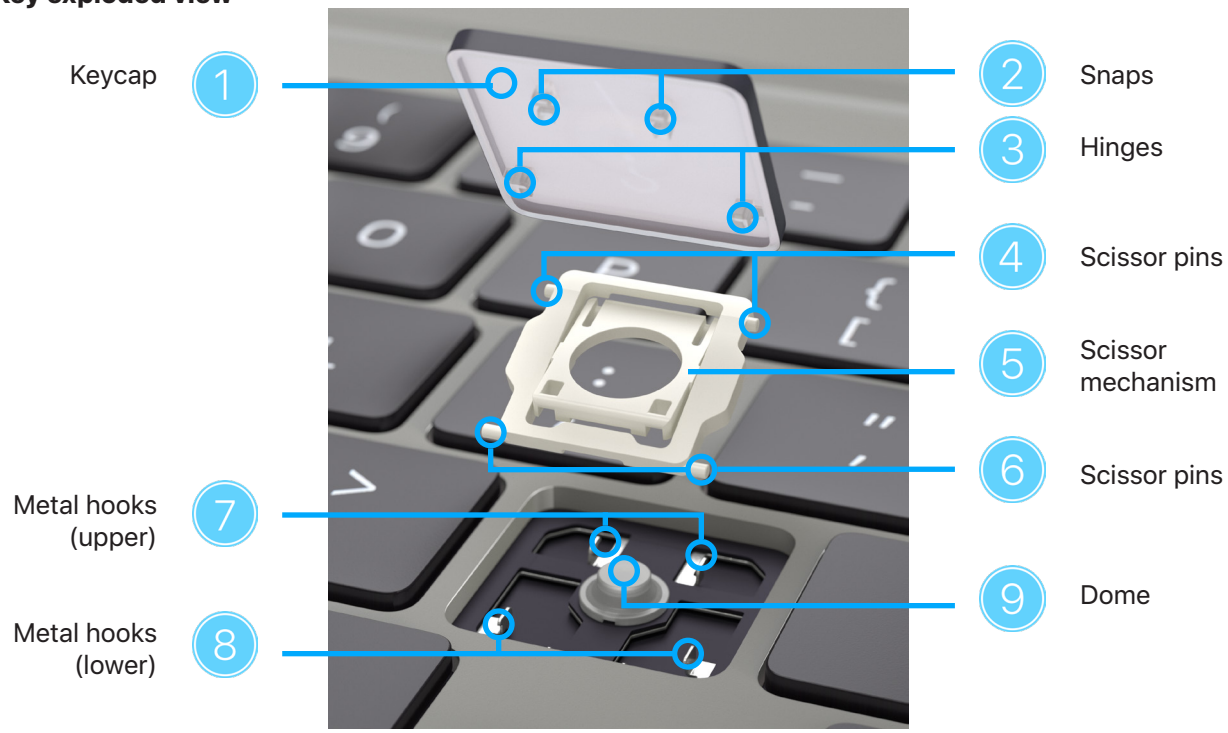
Keys

Before You Begin

Before you repair or replace a key, you need to:

- Know the different key parts — review the exploded view on this page.
- Identify your keyboard design.
- Identify which type of key you're replacing.
- Determine during the keycap removal procedure whether you need to also replace the key's scissor mechanism.

Key exploded view



Tools

- Compressed air
- ESD-safe tweezers
- Keycap levers (Some link bar keycaps require two keycap levers for removal)
- Microterry polishing cloth
- Needle-nose pliers
- Nylon probe (black stick)
- Precut adhesive strips (1x0.5)
- Precut adhesive strips (1x1)

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Clean the keyboard thoroughly with compressed air before you replace a missing keycap or a keycap on an unresponsive key.

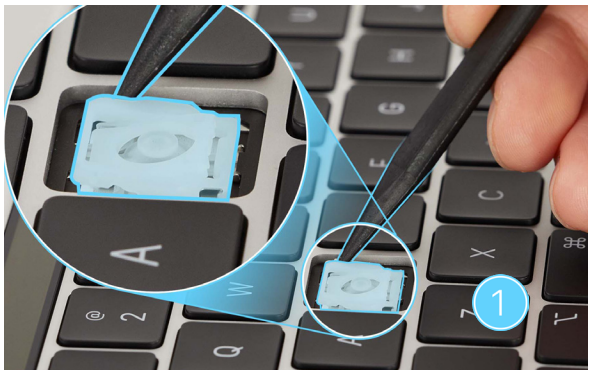
Caution

- The adhesive on the precut adhesive strips that you'll use to remove keycaps is very strong. If you accidentally place the keycap lever on the wrong keycap, you must remove and replace that keycap.
- An adhesive strip can be used only once. You must be replace the adhesive strip for every keycap removal.
- Always replace a keycap that you removed with a new one. Don't reuse keycaps.
- Use gentle pressure on the keycap to activate the adhesive. Do not bend the top case when you press the keycap lever onto the keycap.
- If a keycap replacement doesn't resolve the issue, replace the top case.

Important

Before you replace a keycap, inspect the scissor mechanism, the dome, and the metal hooks inside the well of the keycap:

- Ensure that the scissor mechanism is installed in the well of the keycap. If not, install a replacement scissor mechanism.
- Use the black stick to gently move the scissor mechanism up and down (1). Verify that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
- Press and release the dome (2) — it should spring back upright. If the dome is damaged or not centered, replace the top case.
- If a lower hook is bent (3), try to bend it back to a 90-degree angle.
- If an upper hook is bent (4), use needle-nose pliers to straighten it.
- If any lower hook or upper hook is broken or bent beyond repair, replace the top case.



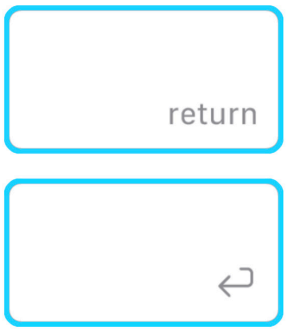


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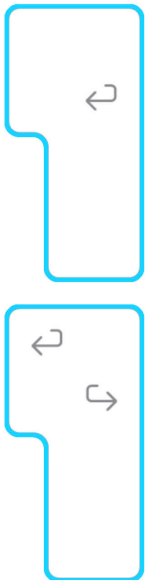
Keyboard identification

Determine your keyboard design by comparing your Return key to the images:

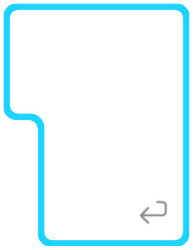
ANSI



ISO



JIS



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Key Identification

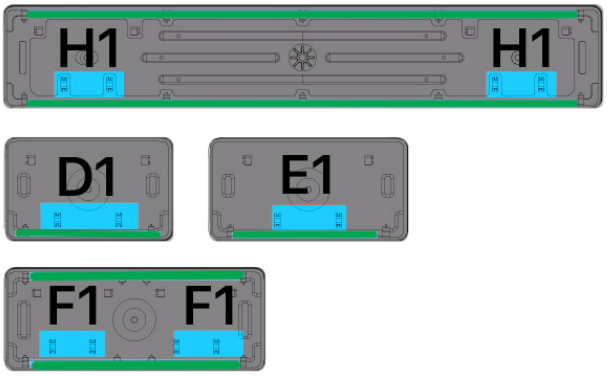
1x1 Keys



1x0.5 Keys



Link Bar Keys



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1x1 Keys

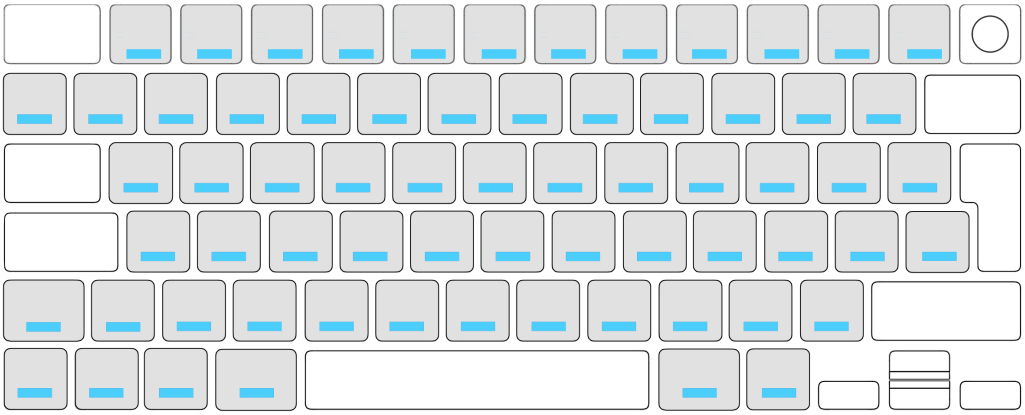
Maps

The 1x1 keys are highlighted, and the blue bars show the location of snaps.

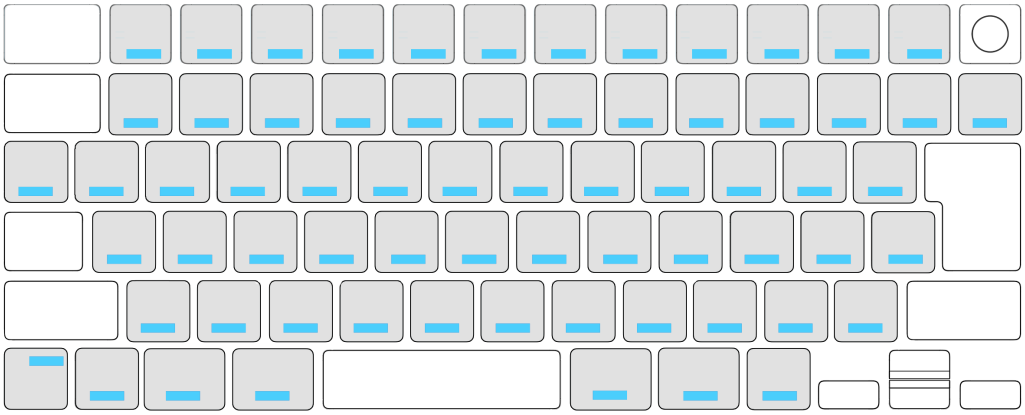
ANSI



ISO



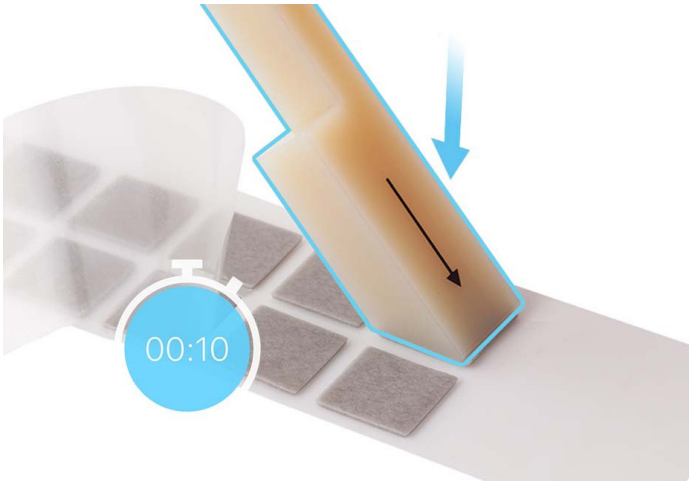
JIS



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Removal

1. Peel the frosted liner from one side of the 1x1 precut adhesive strips. Press and hold the large end of the keycap lever on the adhesive for 10 seconds.



2. Lift the keycap lever and the adhesive to separate them from the white liner.

3. Lightly press the large end of the keycap lever and the adhesive onto the key.

Important

- The arrow on the lever must point to the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard.
- Use the map for the 1x1 keys to identify the location of each snap.
- On the JIS keyboard, the snaps for the 1x1 Caps Lock key are on the display side of the keycap.

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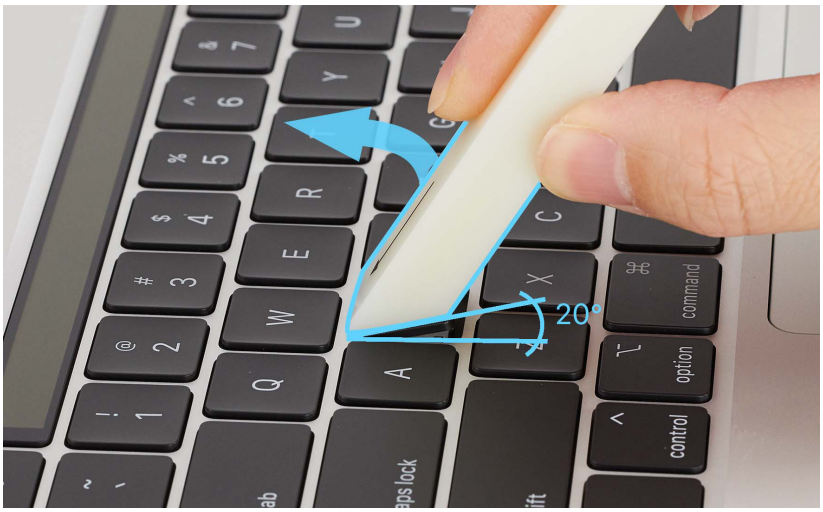
4. Hold the keycap lever on the key for 10 seconds to activate the adhesive.



5. Tilt up the keycap lever in the direction of the arrow until you feel the snaps release.

Caution

To avoid damaging the scissor mechanism, don't tilt up the keycap more than 20 degrees.



6. Lift the keycap off the keyboard.

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7. Use the black stick to gently move the scissor mechanism up and down. Ensure that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.



8. Inspect the well of the keycap:
 - Use the black stick to press and release the dome through the top of the scissor mechanism — the dome should spring back upright. If the dome is damaged or not centered, replace the top case.
 - If a lower hook is bent, try to bend it back to a 90-degree angle.
 - If an upper hook is bent, use needle-nose pliers to straighten it.
 - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.
9. Use compressed air to clean the well of the keycap.

 Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

10. Remove the keycap and adhesive from the keycap lever. Discard the keycap and adhesive.

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Reassembly

1. Gently push the hinged side of the replacement keycap into the hinged side of the well at a 15-degree angle until the hinges engage.



2. Gently press the top of the keycap to engage the snaps.



3. Tap the key repeatedly to check that it springs back each time. Compare the response of the replacement keycap with the response of the keycaps around it.

4. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

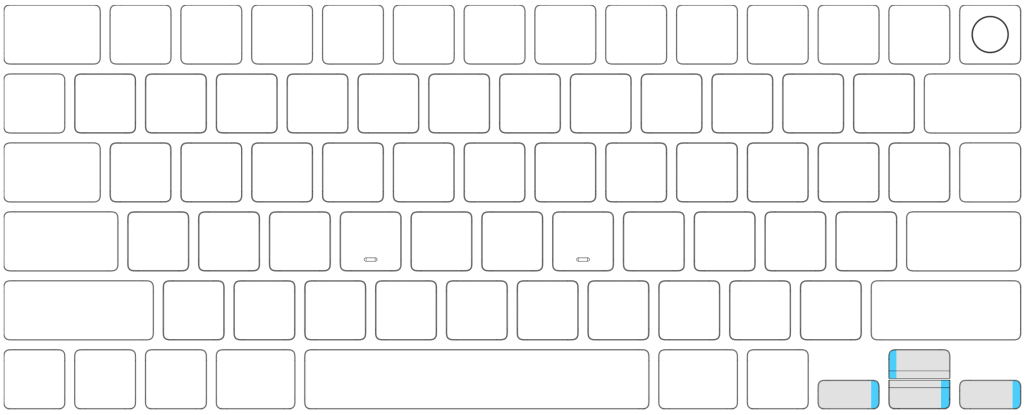
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1x0.5 Keys

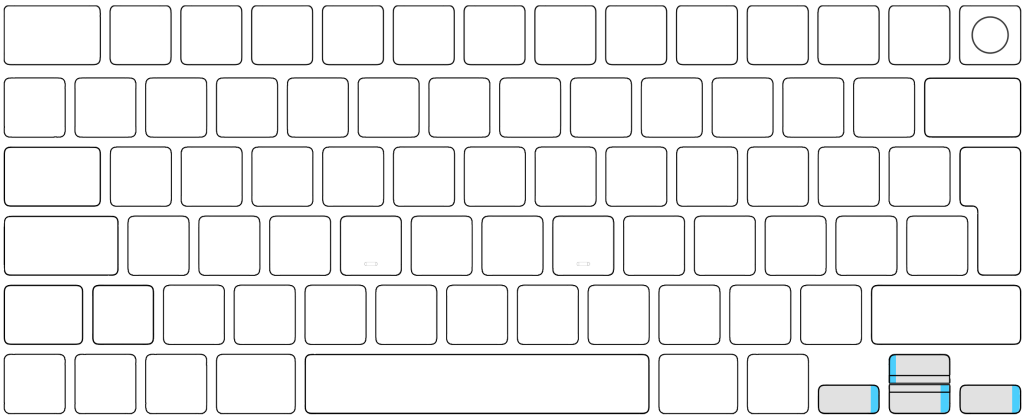
Maps

The Arrow keys are highlighted, and the blue bars show the location of snaps.

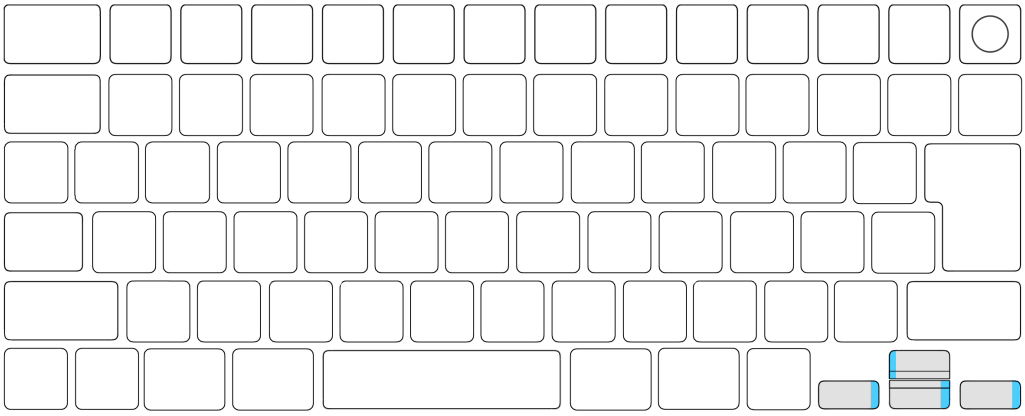
ANSI



ISO



JIS



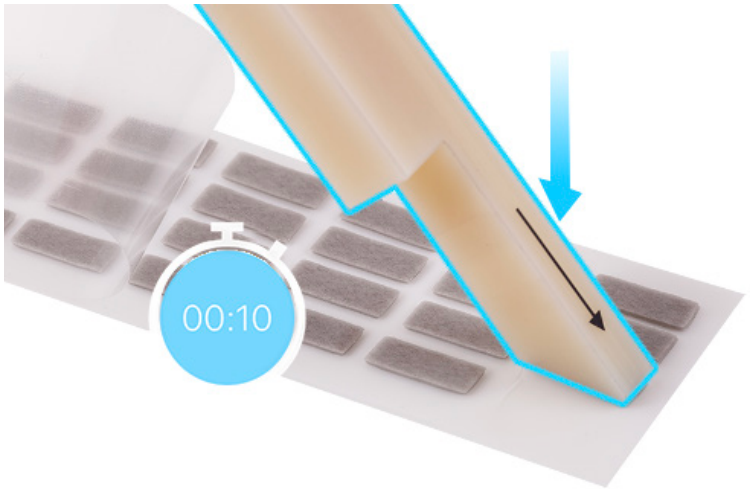
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Removal

Important

- The hinges of the bottom-row arrow keys are on the left. Point the arrow on the keycap lever toward the left.
- The hinges of the Up Arrow key and Escape key are on the right. Point the keycap lever arrow toward the right.

1. Peel the frosted liner from one side of the 1x0.5 precut adhesive strips. Press and hold the small end of the keycap lever on the adhesive for 10 seconds.



2. Lift the keycap lever and the adhesive to separate them from the white liner.

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3. Lightly press the small end of the keycap lever and the adhesive onto the key.



Important

Point the arrow on the lever toward the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard. You can find the location of the snaps at the 1x0.5 Keys Maps.

4. Hold the keycap lever on the key for 10 seconds to activate the adhesive.

5. Push the keycap lever toward the arrow and tilt up the lever until you feel the snaps release.



Caution

To avoid damaging the scissor mechanism, don't tilt up the keycap more than 20 degrees.

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6. Push the keycap lever toward the hinge to release the keycap (1). Lift up the keycap lever to release the keycap from the snaps (2).



7. Inspect the scissor mechanism and well of the keycap:
 - Use the black stick to gently move the scissor mechanism up and down (1). Verify that the scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
 - Use the black stick to press and release the dome through the top of the scissor mechanism — the dome should spring back upright. If the dome is damaged or not centered, replace the top case.
 - If a lower hook is bent, try to bend it back to a 90-degree angle.
 - If an upper hook is bent, use needle-nose pliers to straighten it.
 - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

8. Use compressed air to clean the well of the keycap.

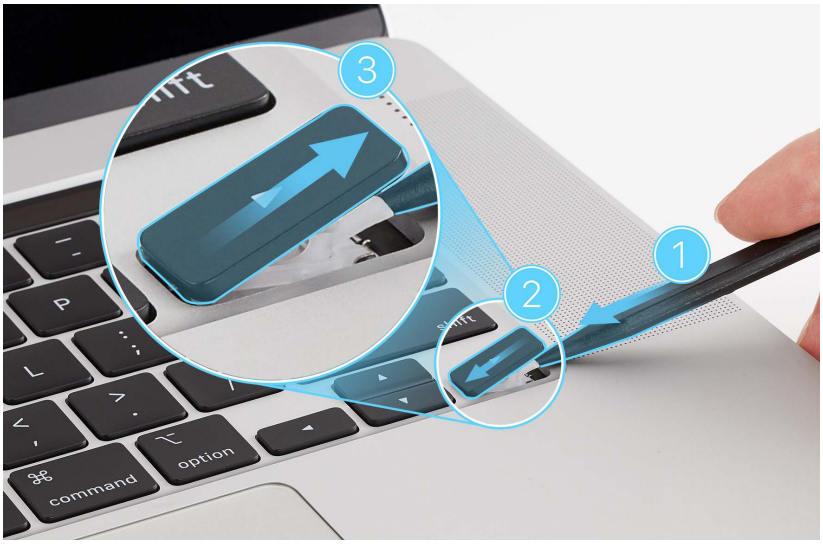
 Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

9. Remove the keycap and adhesive from the keycap lever. Discard the keycap and adhesive.

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Reassembly

1. Use the black stick to lift the scissor slightly (1). Insert the hinged side of the replacement keycap into the well at a 15-degree angle as shown (2). Slide the keycap back toward the snap to engage the hinge (3).



2. Remove the black stick and gently press the top of the keycap to engage the snaps.

3. Tap the key repeatedly to check that it springs back each time. Compare the response of the replacement keycap with the response of the keycaps around it.

4. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

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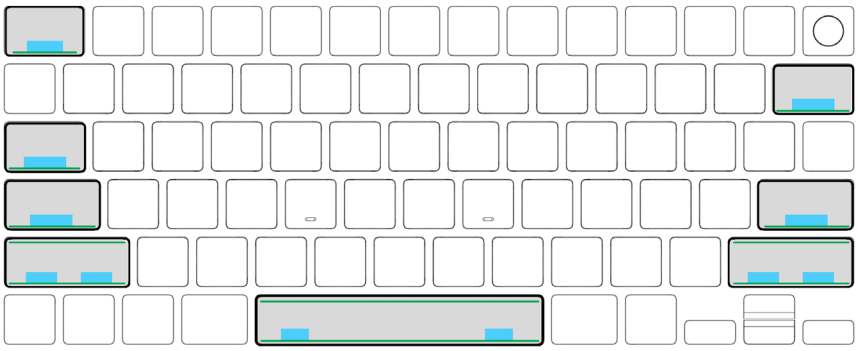
Link Bar Keys

Maps

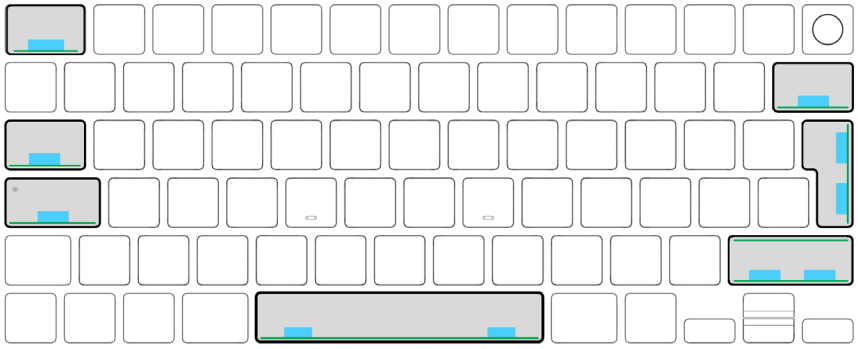
Link Bar keys are highlighted and include the following:

- Escape
- Shift
- Delete
- Return
- Space Bar
- Tab
- Caps Lock

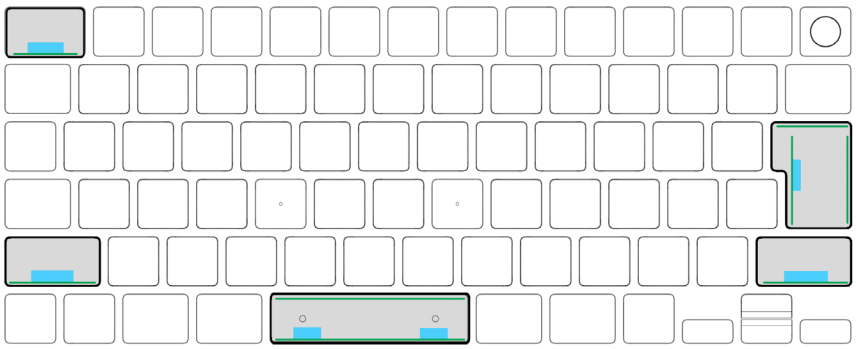
ANSI



ISO



JIS



Note:

- Blue bars show the location of snaps.
- Green lines show the location of link bars.

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Removal

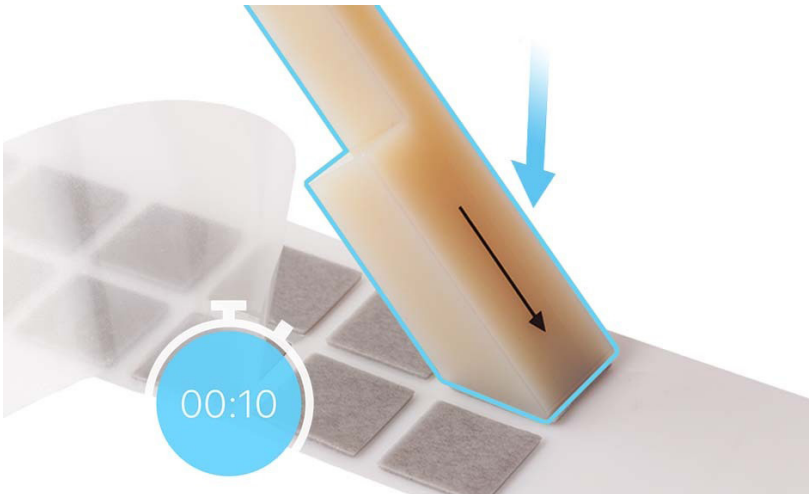
Important

Use two keycap levers for keys with two snaps. You can see these key types in the Link Bar Key Maps.

Note: This procedure shows the removal and reassembly of the Space bar, but the steps are the same whether a link bar key requires using one or two keycap levers. Notes and alerts describe how the procedures vary for the other types of link bar keys.

1. Identify the location of the snaps under the key that you need to replace using the Link Bar Key Maps.

2. Peel the frosted liner from one side of the 1x1 precut adhesive strips. Press and hold the large end of the keycap lever on the adhesive for 10 seconds. Lift the keycap lever and the adhesive to separate them from the white liner.



3. Place the keycap lever on its side. Repeat step 2 with the second keycap lever, then continue to step 4.

4. Align the keycap levers over the snaps.

5. Lightly press the adhesive ends of the keycap levers onto the key.

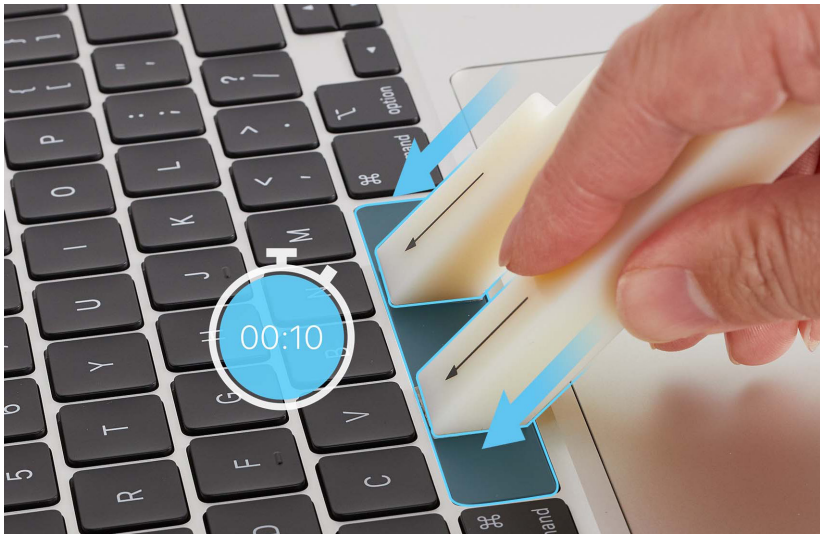
Important

Point the arrow on a lever to the hinged side of the keycap, which is opposite of the side that snaps onto the keyboard. You can find the location of the snaps in the Link Bar Key Maps.

Note: The JIS Return key has three link bars and one side snap. Position the keycap lever so that the arrow points toward the link bar on the right side of the keyboard.

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6. Hold the keycap levers and adhesive on the key for 10 seconds to activate the adhesive.



7. Tilt up the keycap levers in the direction of the arrows until you feel the snaps release.

Caution

For a key with one link bar, don't tilt up the keycap more than 20 degrees.



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Important

The bottom link bar on larger keys might stick to the keycap during removal. If this happens, hold the two keycap levers and insert the black stick between the keycap and the bottom link bar. Use the black stick to release the link bar into the keycap well.



8. Remove the keycap.

9. Inspect the scissor mechanisms and keycap wells.
 - Use the black stick to gently move each scissor mechanism up and down. Verify that each scissor mechanism moves easily and lies flat when released. If it does not, replace the scissor mechanism.
 - Use the black stick to press and release each dome through the top of the scissor mechanism — a dome should spring back upright. If a dome is damaged or not centered, replace the top case.
 - If a lower hook is bent, try to bend it back to a 90-degree angle.
 - If an upper hook is bent, use needle-nose pliers to straighten it.
 - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

10. Use compressed air to clean the well of the keycap.

 Note: If compressed air doesn't dislodge visible debris, use a microterry polishing cloth to gently dislodge the debris.

11. Remove the keycap and adhesives from the keycap lever. Discard the keycap and adhesives.

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Reassembly

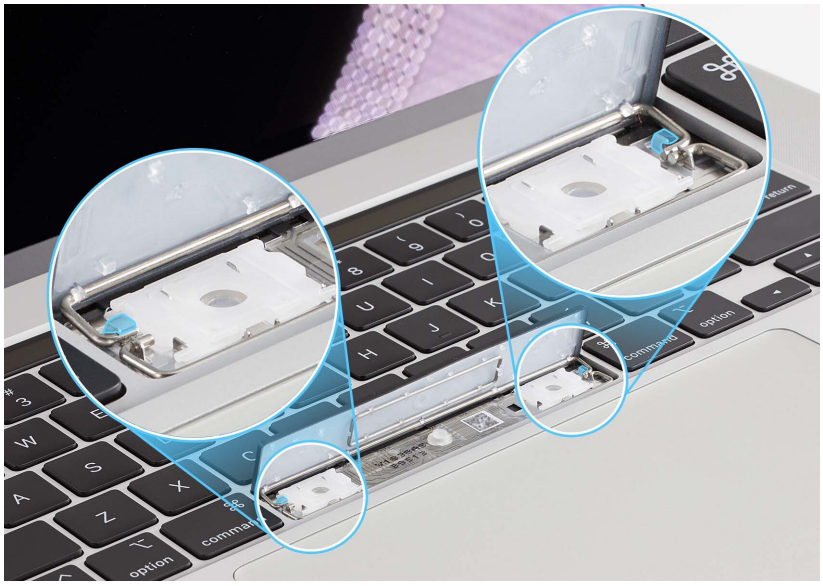
Important

For the keycaps that have more than one link bar, check that the top link bar is preinstalled on the replacement keycap.

Note: On the JIS Return key, the link bar that fits into the right side of the keycap well is preinstalled.



1. Position the keycap in the well and insert the top link bar into the metal hooks that are on each side of the well.



Important

To reinstall the JIS Return key, insert the keycap into the right side of the well.

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2. Push the keycap forward to set the top link bar in place.

3. Gently press the snaps and scissor mechanisms as shown to engage the keycap. You can find the snap locations in the Link Bar Key Maps.

 Note: For keys with one link bar, gently push the hinged side of the replacement keycap into the hinged side of the well at a 15-degree angle until the hinges engage. Then gently press the snap or snaps.



4. Tap the key repeatedly to verify that it springs back each time. If the keycap doesn't appear to be correctly installed, repeat all removal and reassembly steps with a new keycap.

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Scissor Mechanisms
Removal

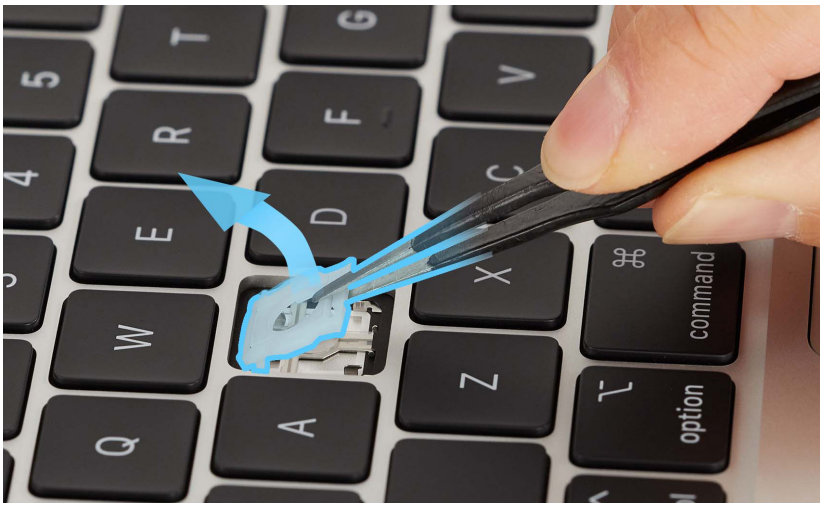
Important

- Do not remove a scissor mechanism unless it is damaged. You can find the correct replacement in Scissor Mechanism Identification.
- Note the orientation of the scissor mechanism before you remove it.

1. Use the black stick to disengage the scissor pins from the lower hooks.



2. Use tweezers to lift the scissor mechanism out of the well.



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3. Inspect the well of the keycap:
 - When you press and release the dome, it should spring back upright. If the dome is damaged or not centered, replace the top case.
 - If a lower hook is bent, try to bend it back to a 90-degree angle.
 - If an upper hook is bent, use needle-nose pliers to straighten it.
 - If any lower hook or upper hook is broken or bent beyond repair, replace the top case.

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Reassembly

1. Use compressed air to clean the well of the keycap.

 Note: If compressed air doesn't dislodge visible debris, use the black stick to gently dislodge it.

2. Use ESD-safe tweezers to position the scissor in the well and engage the upper hooks.



3. Use the black stick to engage the scissor pins with the lower hooks. The pin is engaged as shown (1). The pin is not engaged as shown (2).



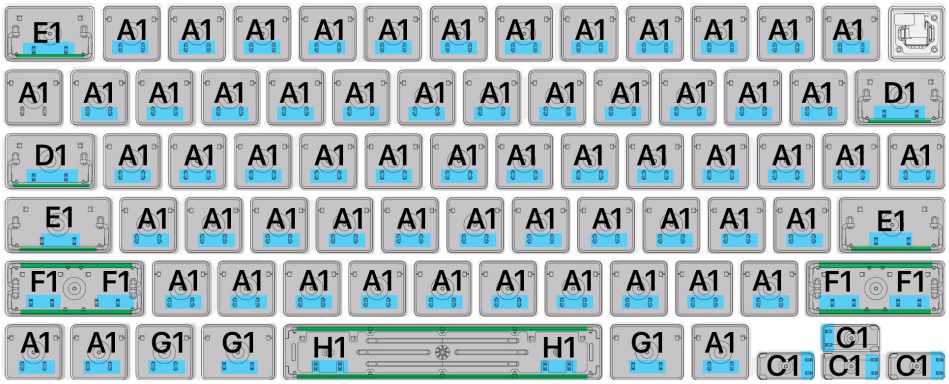
4. Use the black stick to gently move the scissor mechanism up and down. Ensure that the scissor mechanism moves easily and lies flat when released.

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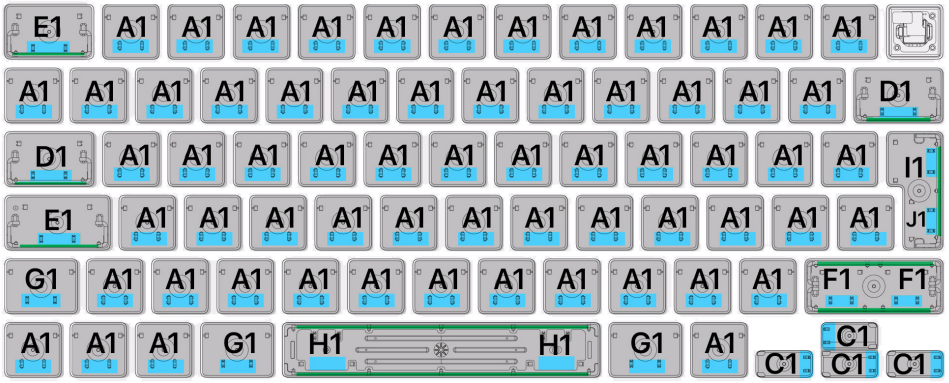
Keyboard Maps

Each symbol on the maps below corresponds to a symbol on the scissor mechanism identification chart and the scissor bag. Blue indicates where the snaps are located, and green indicates link bars.

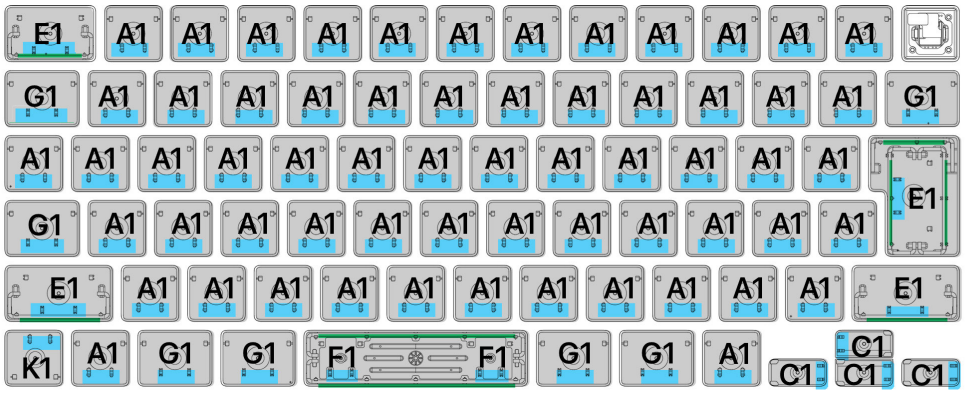
ANSI



ISO



JIS

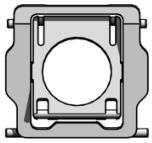


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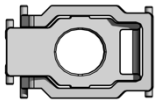
Scissor Mechanism Identification

Match the scissor mechanism to the label to identify the correct replacement. Don’t replace a scissor mechanism unless it is broken.

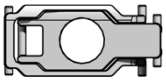
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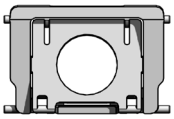
B1



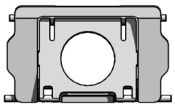
C1



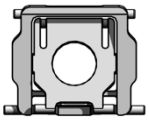
D1



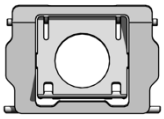
E1



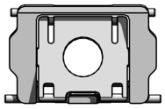
F1



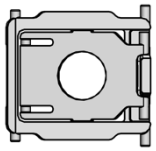
G1



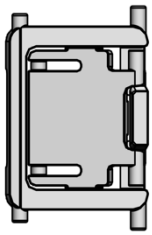
H1



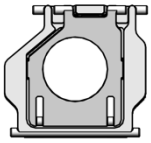
I1



J1



K1



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Bottom Case

Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Tools

- Battery cover
- Cut-resistant gloves
- ESD-safe tweezers
- Fine-tip permanent marker
- Microterry polishing cloth
- Nylon probe (black stick)
- Pentalobe screwdriver
- Suction cup
- Torx T3 screwdriver
- Torx T5 screwdriver



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Removal

1. Place the computer on a clean, flat surface with the bottom faceup.

2. Use the pentalobe screwdriver to remove four long pentalobe screws (1).

 Note: The screw color is specific to your model.

 - Silver (923-06867)
 - Space gray (923-06869)

3. Use the pentalobe screwdriver to remove four short pentalobe screws (2).

 Note: The screw color is specific to your model.

 - Silver (923-06866)
 - Space gray (923-06868)



4. Press the suction cup to attach it to the lower left corner of the bottom case.



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5. Four internal clips attach the bottom case to the top case. Pull up the handle of the suction cup until you feel the two internal clips on the left release.



6. Squeeze the edges of the suction cup to release it.



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7. Move the suction cup to the lower right corner and press the top to attach it to the bottom case.



8. Pull up the handle of the suction cup until you feel the two internal clips on the right release.



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9. Squeeze the edges of the suction cup to release it.



10. Insert the flat end of the black stick into the vent/antenna module gap between the display and top case (1) as shown. Then pull the black stick to disengage the spring fingers (2). Repeat this on the other end of the gap.



11. Remove the bottom case and set it faceup on a clean, flat surface.

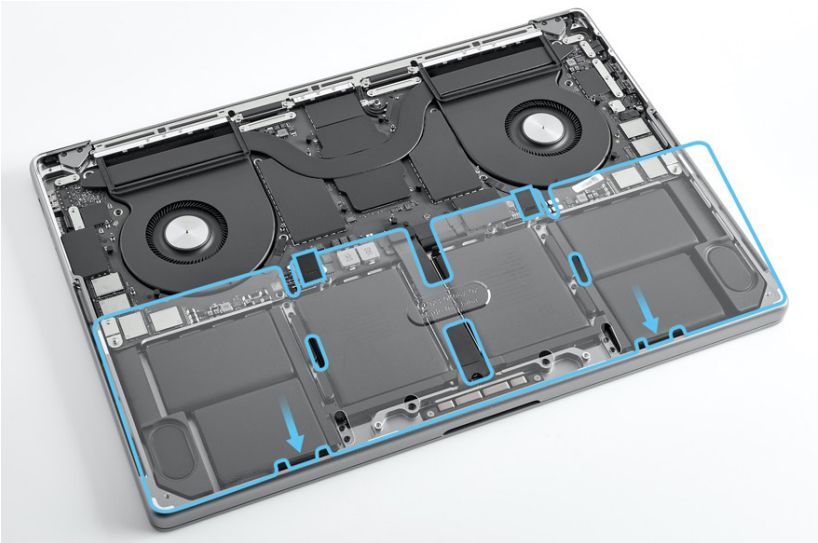
Important

If you're replacing the bottom case:

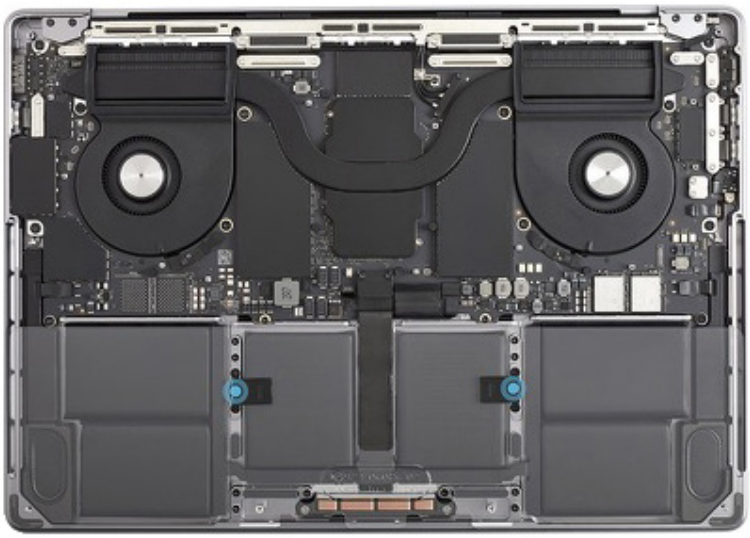
- Keep the existing bottom case until the repair is complete.
- Use a fine-tip permanent marker to write the computer serial number on the inside of the replacement bottom case.
- If you're replacing only the bottom case and no other parts, skip to reassembly step 8.

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12. Place the battery cover on the battery.

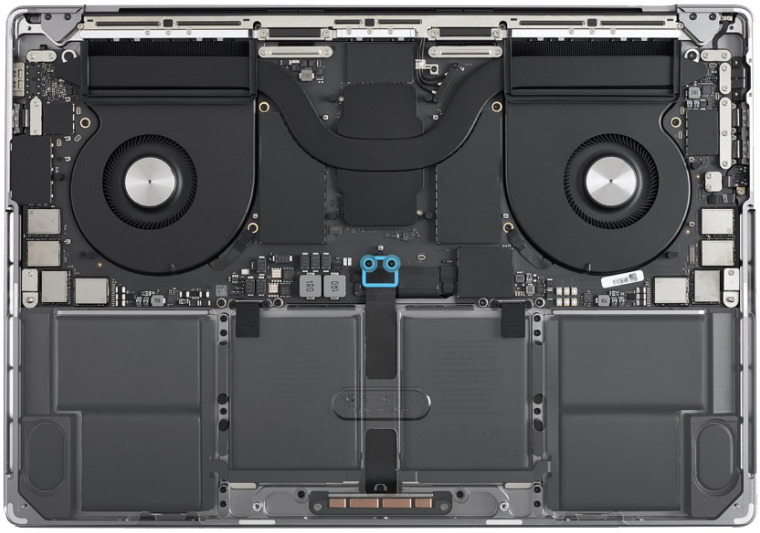


13. Press the black tabs on the battery cover into the clips on the top case until you feel a click.

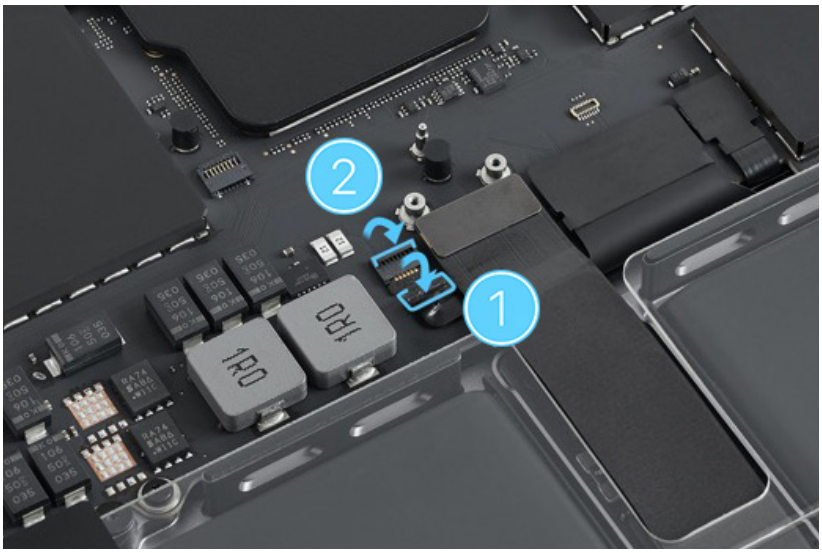


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14. Use the T3 screwdriver to remove the two T3 screws (923-06851) from the trackpad connector cowling. Remove the cowling and save it for reassembly.



15. Gently peel the polyester film tab off the locking lever of the battery management unit (BMU) flex cable (1). Then use the black stick to flip up the locking lever (2).

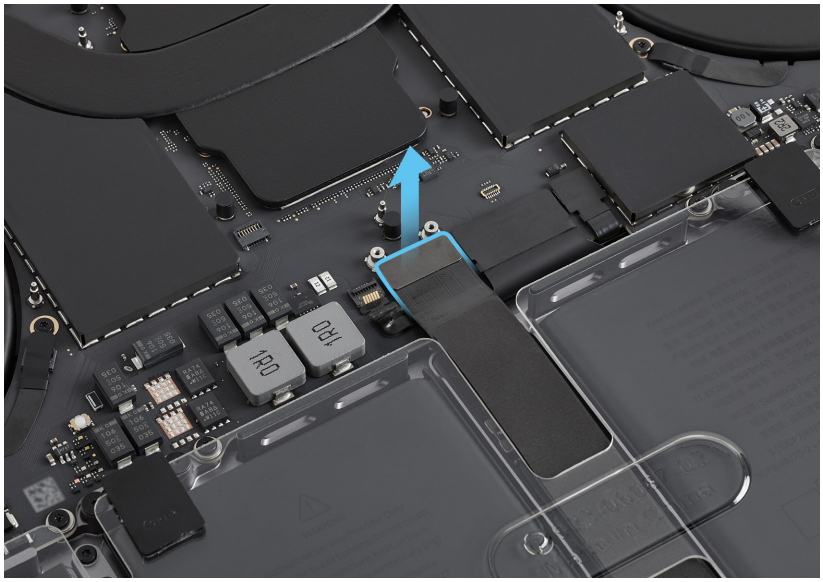


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16. Use ESD-safe tweezers to gently grasp the end of the BMU flex cable and slide it out of the connector.



17. Lift the end of the trackpad flex cable off the connector on the logic board.

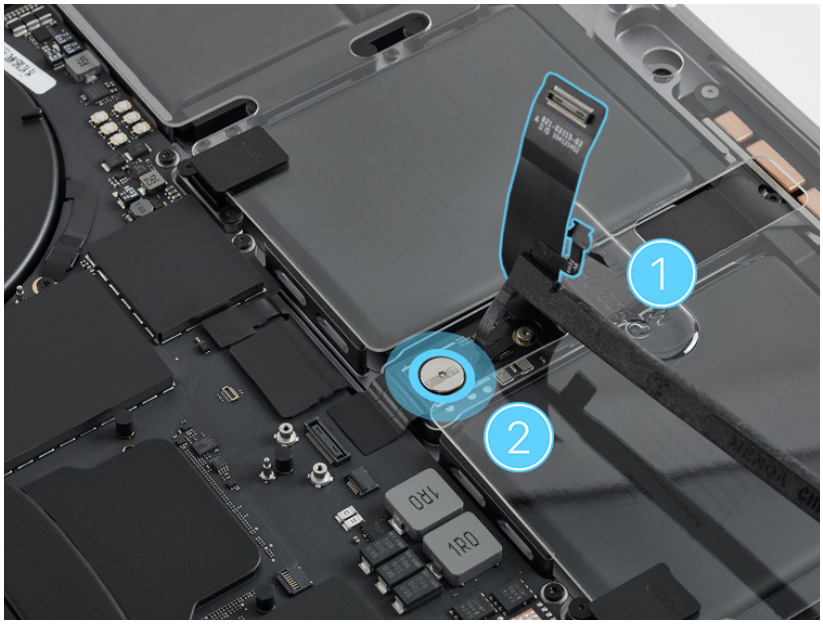


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18. Use the black stick to gently peel the BMU flex cable off the logic board and T5 screw.

19. Use the black stick to gently fold back the BMU flex cable and trackpad flex cable (1).

20. Use the T5 screwdriver to remove the T5 screw (923-06849) (2).



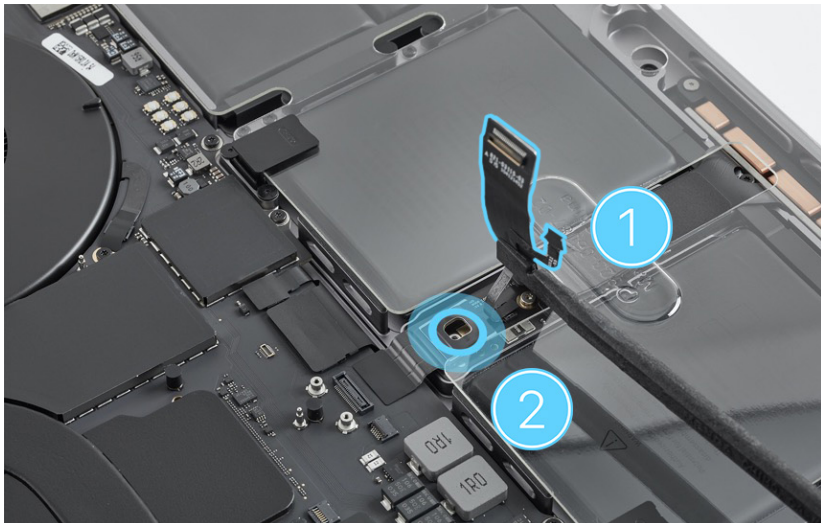
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Reassembly

Important

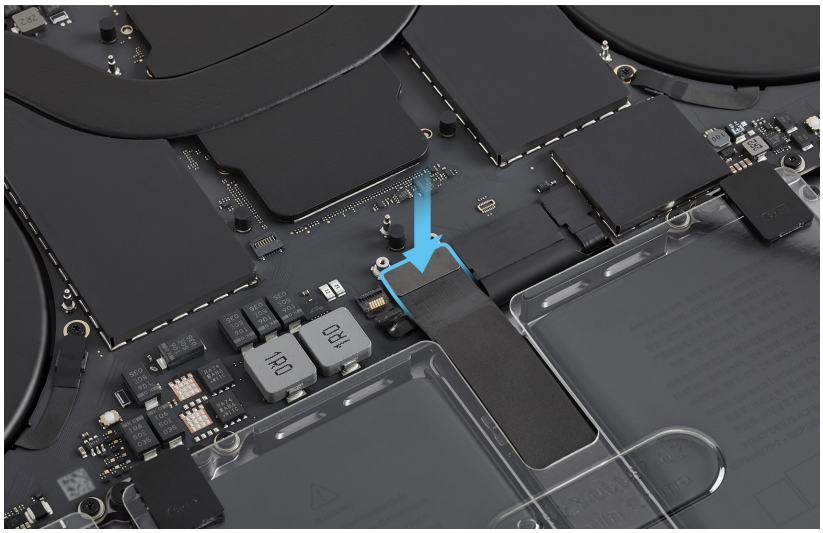
If you're replacing the bottom case, keep the existing bottom case until the repair is complete. Use a fine-tip permanent marker to write the computer serial number on the inside of the replacement bottom case.

1. Use the black stick to gently fold back the BMU and trackpad flex cables (1). Then use the T5 screwdriver to reinstall the T5 screw (923-06849) (2).



2. Gently press along the length of the BMU flex cable to adhere it to the T5 screw and logic board.

3. Press the end of the trackpad flex cable to the connector on the logic board.



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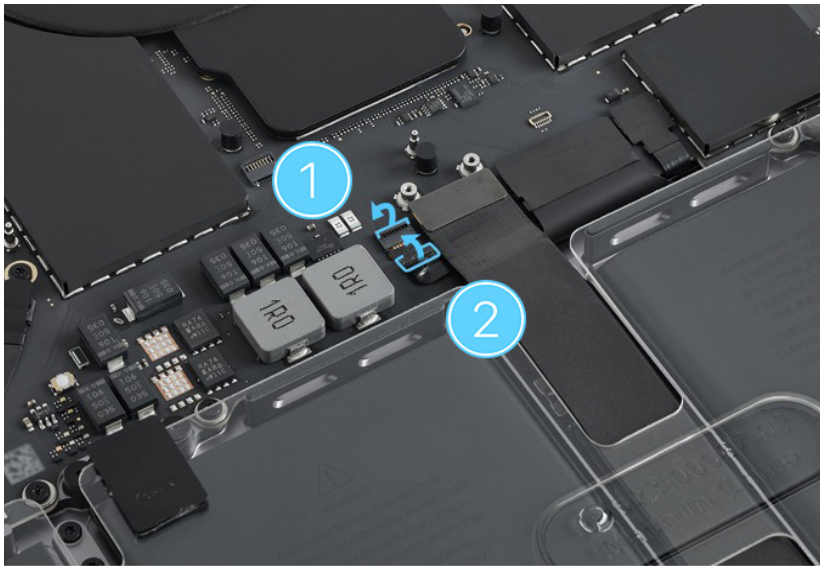
4. Use ESD-safe tweezers to slide the end of the BMU flex cable into the connector.

Caution

Don't crimp the BMU flex cable.

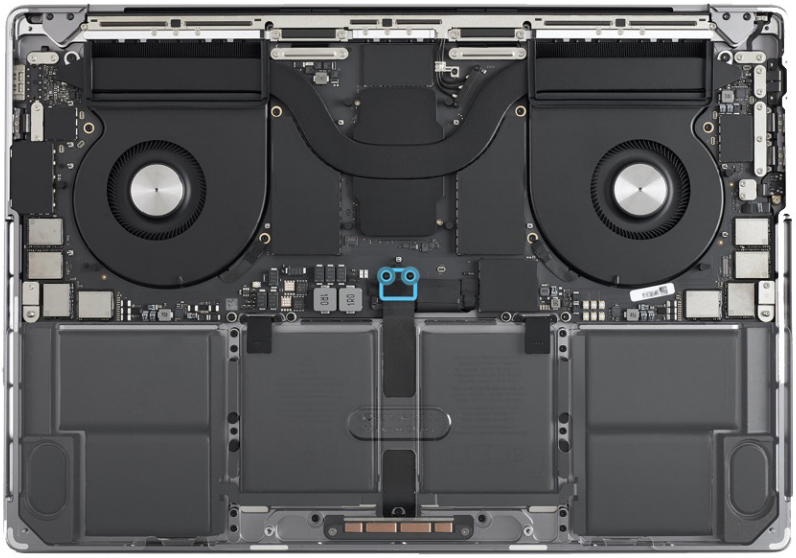


5. Flip down the locking lever of the BMU flex cable (1). Then press the polyester film tab to the locking lever (2).

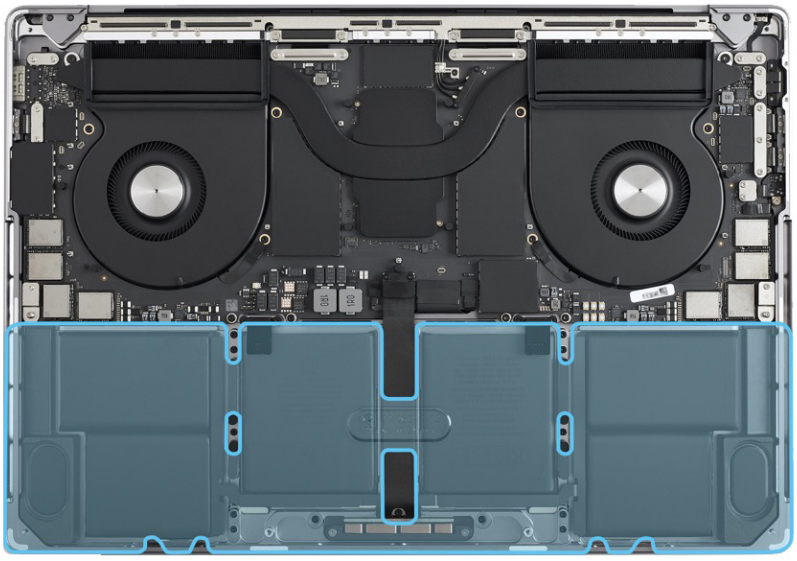


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6. Position the trackpad flex cable cowling over the end of the trackpad flex cable. Then use the T3 screwdriver to reinstall the two T3 screws (923-06851) into the cowling.



7. Hold the battery cover by the edges and lift it off the top case.



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8. Use the microterry polishing cloth to ensure that the bottom case interior is clean and free of debris.

9. Position the bottom case over the top case. Align the back edge of the bottom case with the vent/antenna module. The long edge of the bottom case should be flush with the smooth plane of the vent/antenna module.



10. Put on the gloves. Hold the bottom case by the front corners and slowly push it away from you to align it with the display hinge and top case.



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11. Feel the spring fingers lock as you push the bottom case.



Important

If the bottom case doesn't align, pull it toward you to remove it. Then repeat steps 9 through 11.

12. Lift the front edge of the bottom case no more than 1 inch (2.5 cm) to align the thermal fan ducts.



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13. Press both sides of the bottom case simultaneously until you feel the two internal clips snap into place (1). Then simultaneously press the two areas in the middle (2) to attach the two remaining internal clips.



14. Ensure that all sides of the bottom case align with all sides of the top case. If the cases are misaligned, begin again at removal step 4.

15. Use the pentalobe screwdriver to reinstall four short pentalobe screws (1).

 Note: Use the correct screw color for your model.

 - Silver (923-06866)
 - Space gray (923-06868)

16. Use the pentalobe screwdriver to reinstall four long pentalobe screws (2).

 Note: Use the correct screw color for your model.

 - Silver (923-06867)
 - Space gray (923-06869)



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Important

- System Configuration is required if you've installed a replacement display, lid angle sensor, logic board, top case, or Touch ID board.
- If you replaced the logic board, the computer will start up in Diagnostics mode until you complete System Configuration.
- If you replaced the Touch ID board, it will function only as a power button until you complete System Configuration.
- If you replaced the display, there will be distortion in the top middle of the display until you complete System Configuration.
- After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

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Battery Management Unit Flex Cable

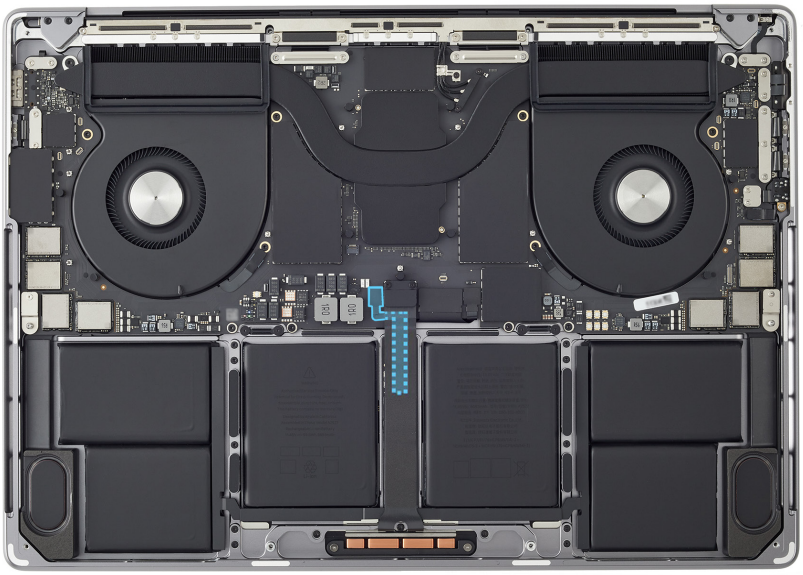
Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Remove the following part before you begin:

- Bottom case



Tools

- ESD-safe tweezers

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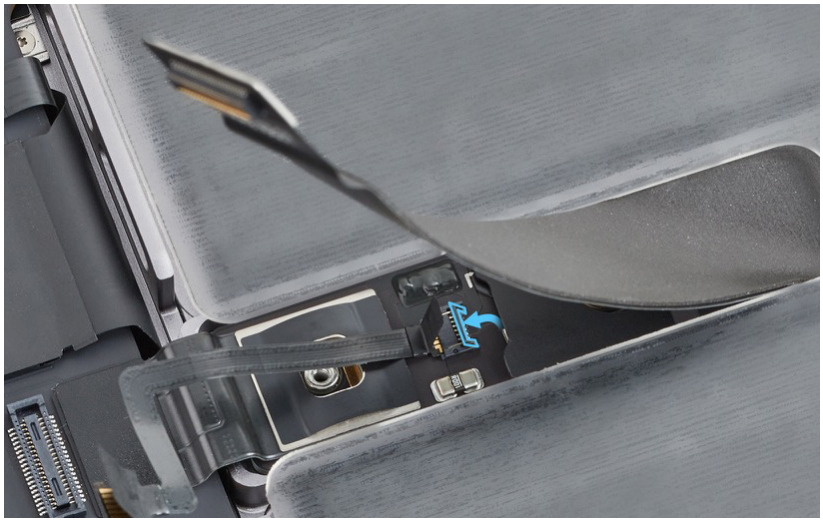
Removal

1. Fold back the trackpad flex cable to access the BMU flex cable.

2. Peel back the polyester film tab from the locking lever of the BMU flex cable.



3. Use the black stick to flip up the locking lever of the BMU flex cable connector.



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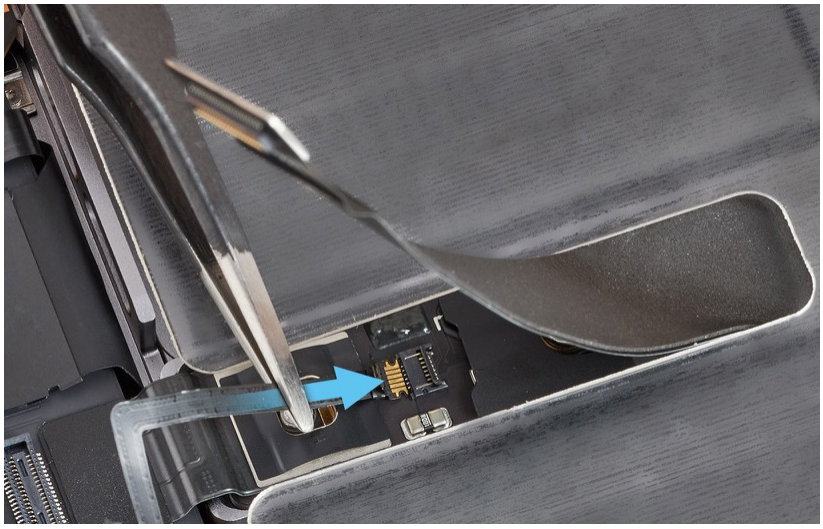
4. Use ESD-safe tweezers to gently slide the end of the BMU flex cable out of the connector.



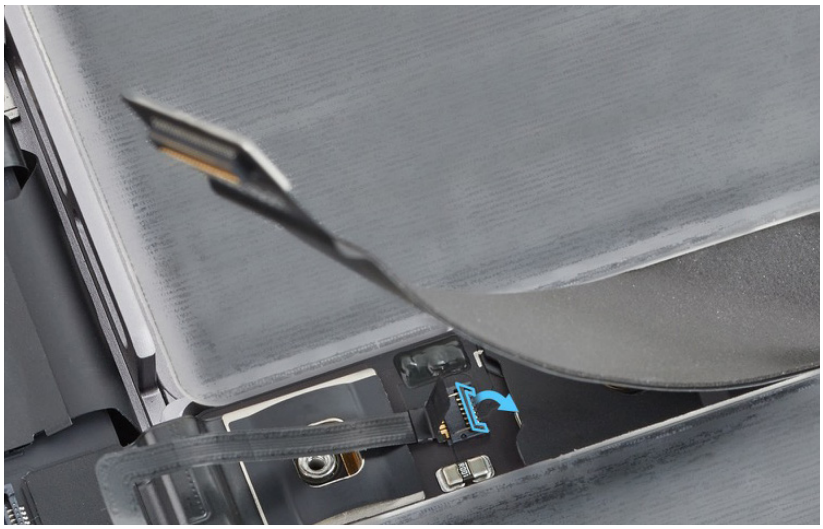
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Reassembly

1. Use ESD-safe tweezers to slide the end of the BMU flex cable into the connector.

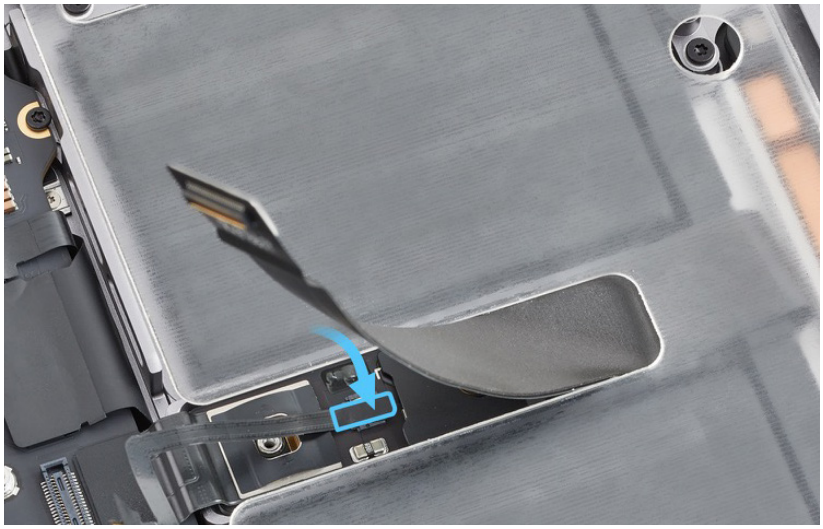


2. Use the black stick to flip down the locking lever on the BMU flex cable connector.



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3. Press the polyester film tab over the connector.



Reinstall the following part to complete reassembly:

- Bottom case

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Lid Angle Sensor

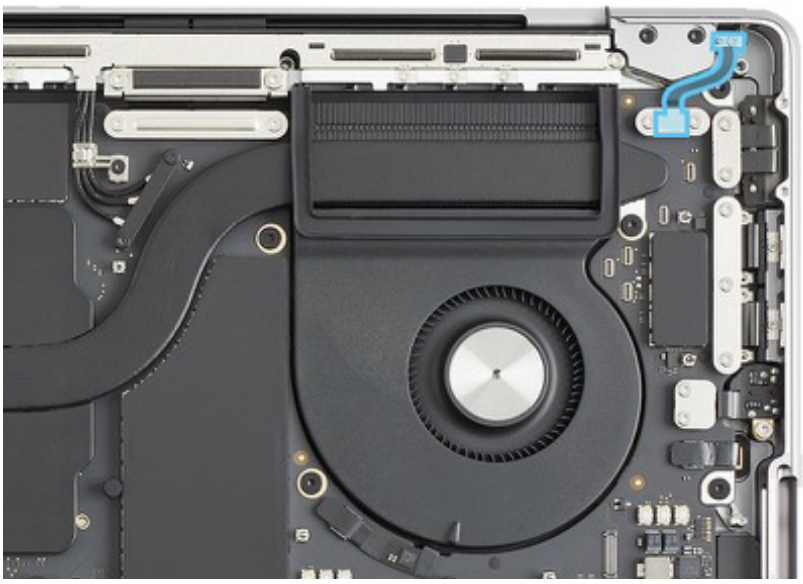
Before You Begin

Remove the following part before you begin:

- Bottom case

Tools

- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx security bit
- Torx T3 screwdriver



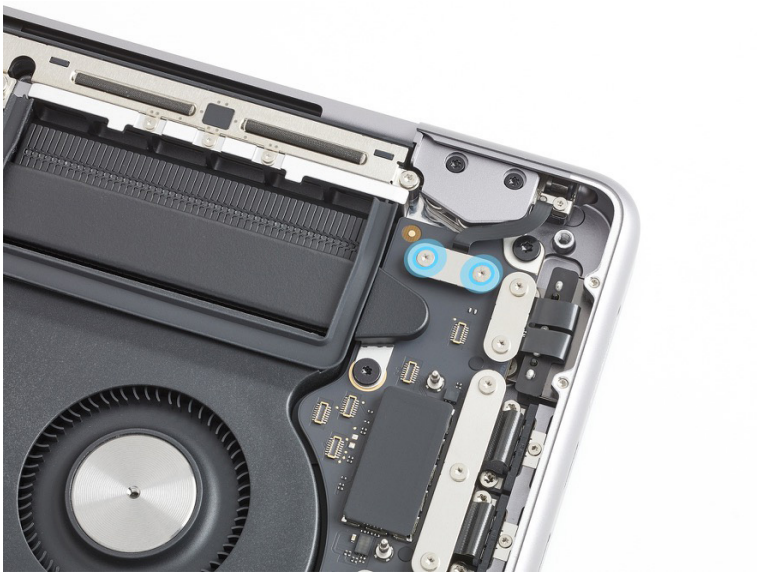
Important

This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

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Removal

1. Use the T3 screwdriver to remove the two T3 screws (923-06854) from the lid angle sensor connector cowling.



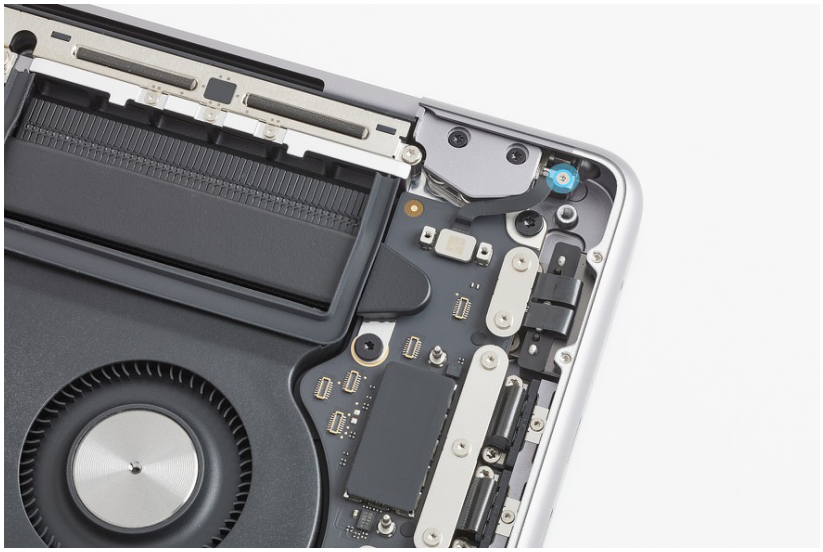
2. Remove the lid angle sensor connector cowling and save it for reassembly.

3. Use the black stick to lift the end of the lid angle sensor flex cable off the connector.

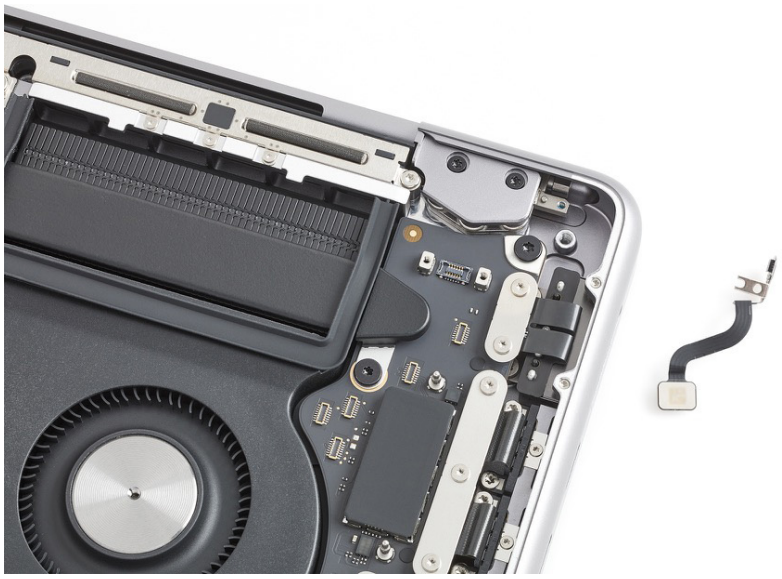


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4. Use the blue torque driver and Torx security bit to remove the 1IPR screw (923-06852) from the lid angle sensor flex cable clip.



5. Remove the lid angle sensor from the top case.

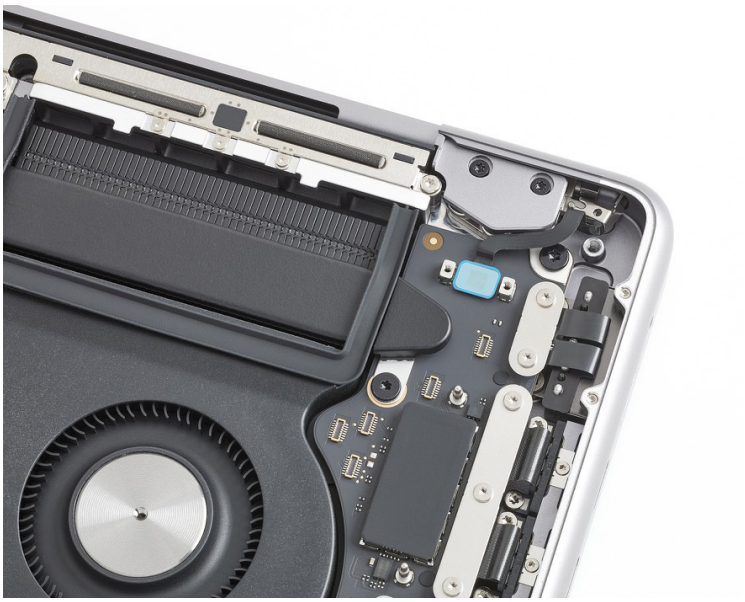


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Reassembly

1. Position the lid angle sensor in the top case.

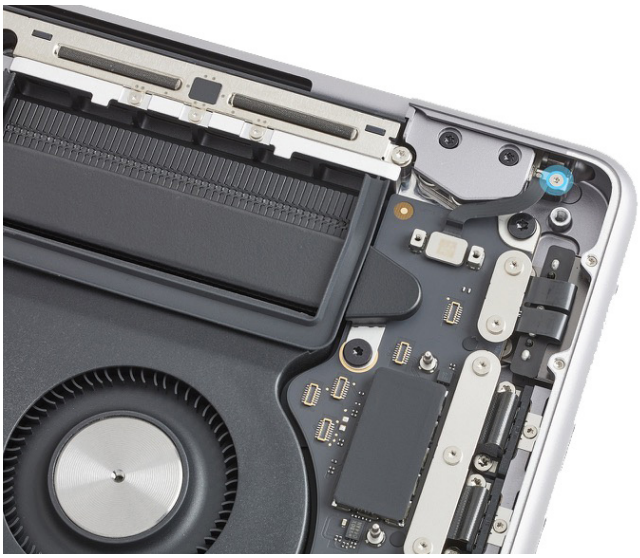
2. Press the end of the lid angle sensor flex cable to the connector on the logic board.



3. Position the lid angle sensor flex cable clip so the hole is aligned with the screw hole in the top case.

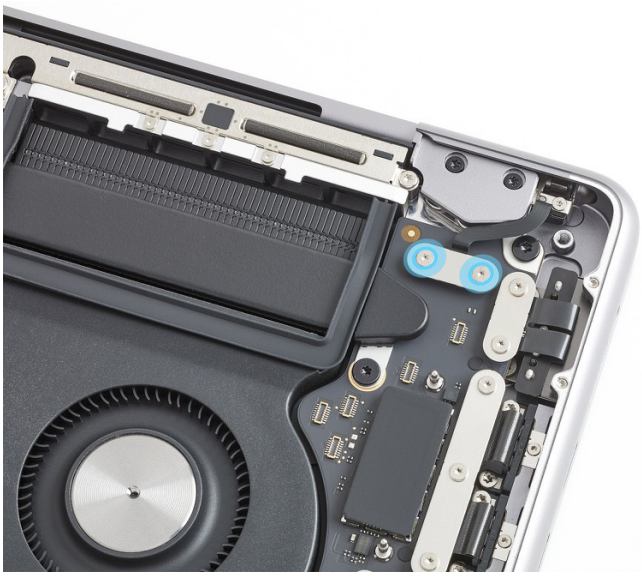
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4. Use the blue torque driver and Torx security bit to reinstall the 1IPR screw (923-06852) into the lid angle sensor flex cable clip.



5. Position the lid angle sensor connector cowling over the end of the lid angle sensor flex cable.

6. Use the T3 screwdriver to reinstall the two T3 screws (923-06854) into the lid angle sensor connector cowling.



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Reinstall the following part to complete reassembly:

- Bottom case

Important

- After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- Close the display when prompted while you run System Configuration. If the display isn't fully closed during the process, you'll need to replace the lid angle sensor. Ensure that you follow all System Configuration steps to complete the repair.

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Trackpad and Trackpad Flex Cable

Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Remove the following part before you begin:

- Bottom case



Tools

- Adjustable torque driver (10–34 Ncm)
- ESD-safe tweezers
- Gap offsets
- Kapton tape
- Nylon probe (black stick)
- Sticky notes (3 by 3 inches)
- Torx T5 bit
- Torx T5 screwdriver

Important

This procedure may require a trackpad shim kit, which only comes with a replacement trackpad. It's not a separate orderable part.

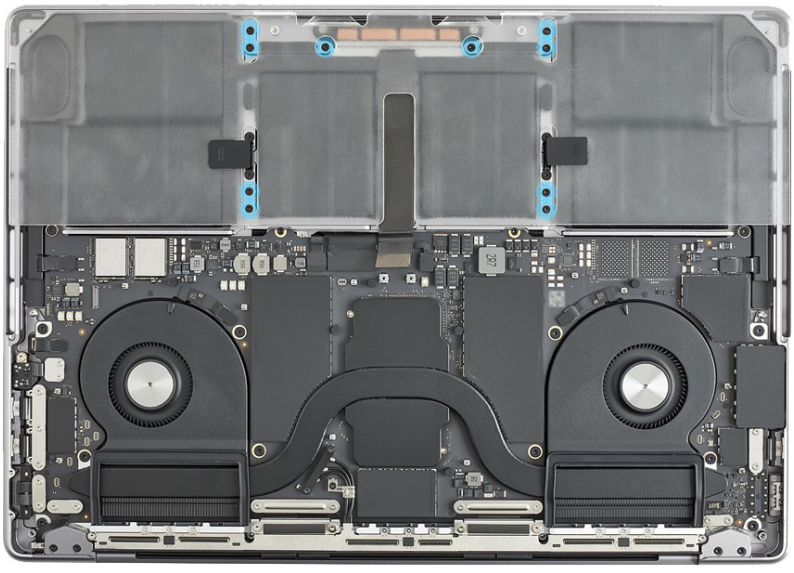
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Removal

1. Open the display to a 90-degree angle. Place the computer on the edge of the table with the display hanging down.



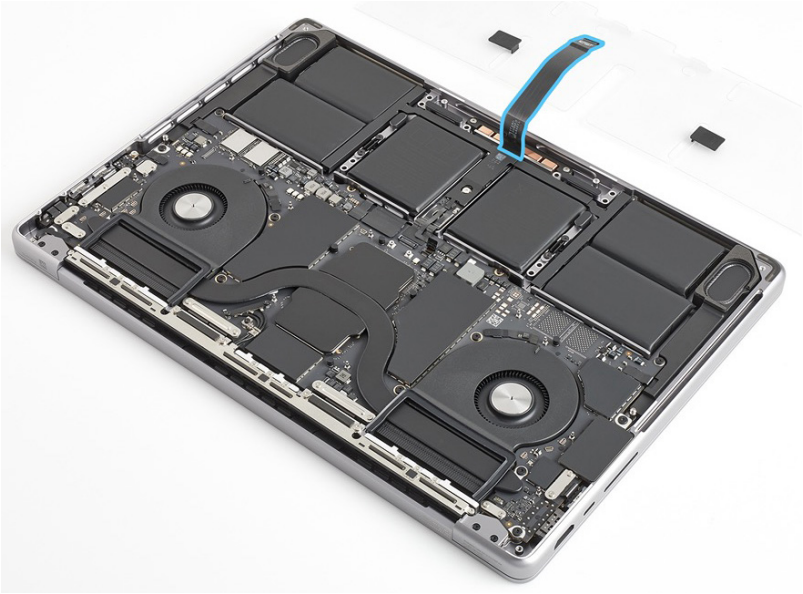
2. Use the T5 screwdriver to remove the eight outer T5 screws (923-06941) and the two inner T5 screws (923-06941).



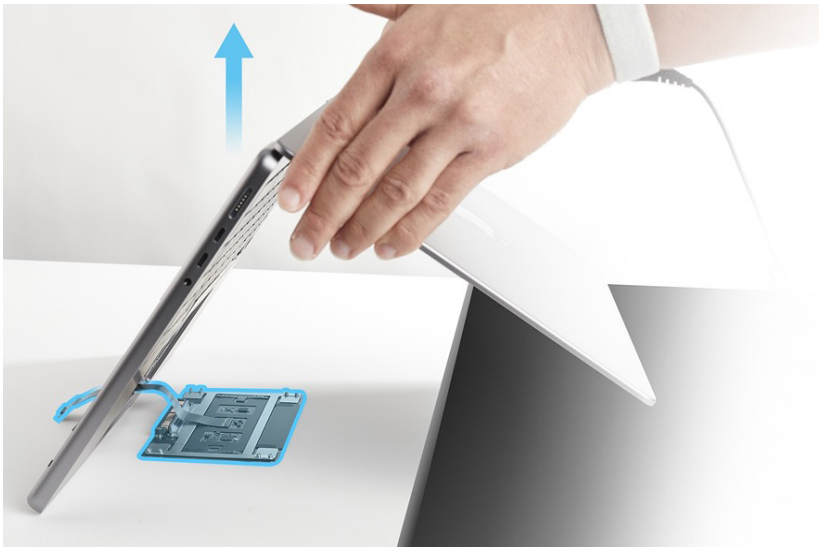
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3. Hold the battery cover by the edges. Then lift it off the top case.

4. Gently peel the trackpad flex cable off the battery.



5. Lift the computer off the table and allow the trackpad flex cable to pass through the opening in the top case. Leave the trackpad flat on the table to keep the shims in place.

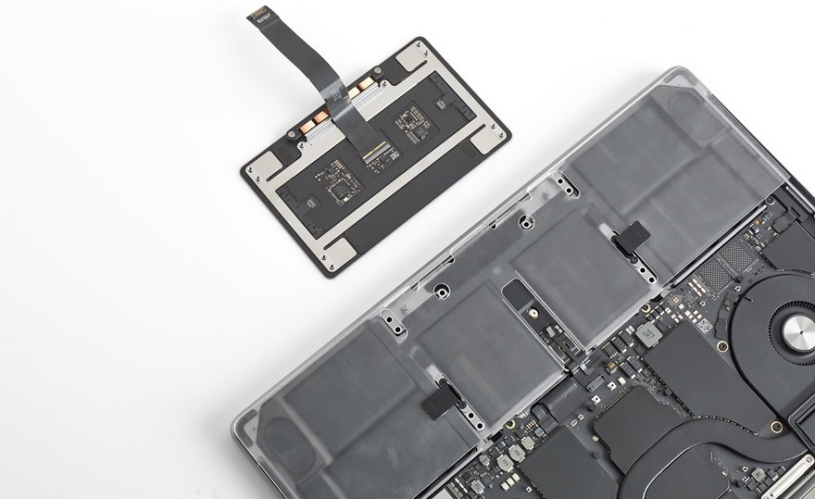


Important

If the shims fall out, they must be reinstalled in their original locations. If you can't determine the shims' original locations, replace them. A replacement shim kit is available only with a replacement trackpad.

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6. Place the computer on the edge of the table with the display hanging down.

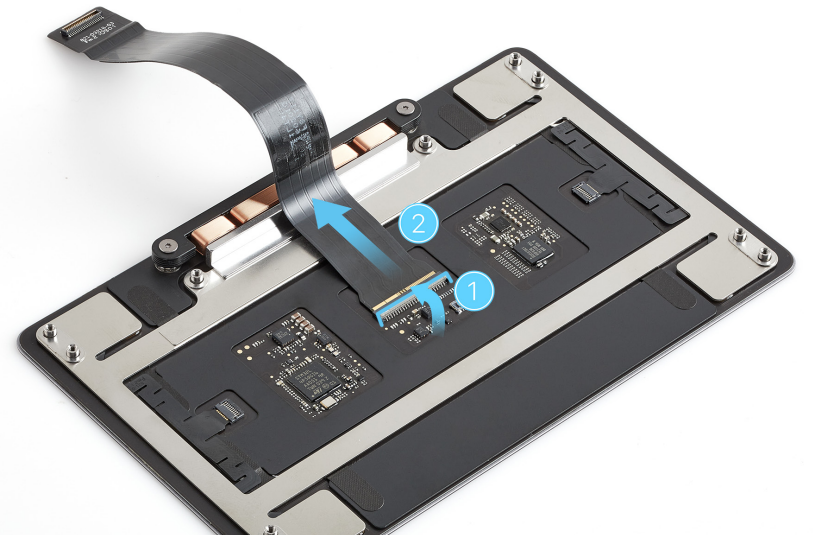


7. Place the battery cover on the battery. Then press the black tabs into the clips on the top case until you feel a click.

Important

If you're reinstalling the existing trackpad but the trackpad flex cable is damaged, continue to step 8. If you're reinstalling the existing trackpad and trackpad flex cable or you're installing a replacement trackpad, skip to reassembly.

8. Flip up the locking lever on the trackpad flex cable connector (1). Then slide the end of the trackpad flex cable out of the connector (2).



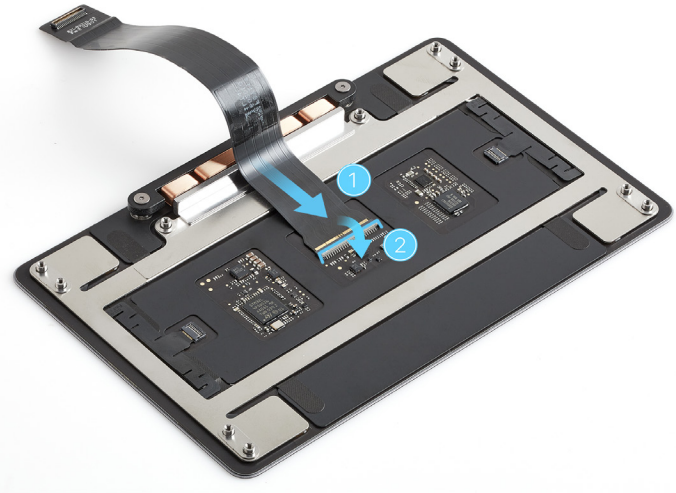
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Reassembly

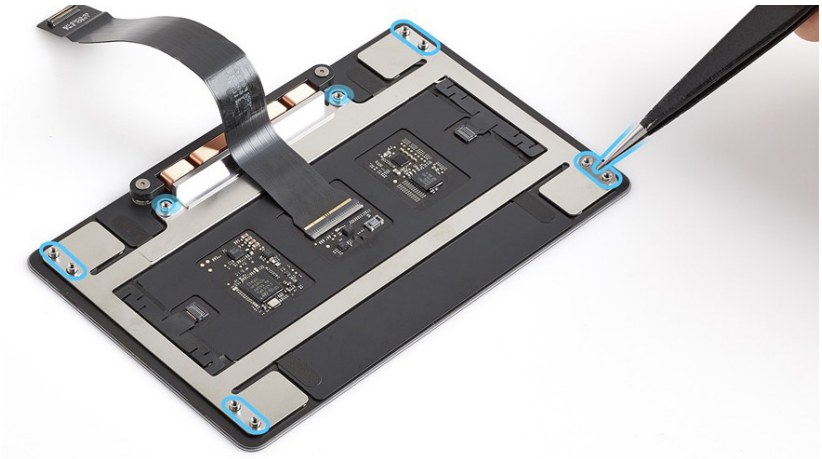
Important

If you're reinstalling the existing trackpad but replacing the trackpad flex cable, complete reassembly step 1. If you're installing replacement trackpad shims or reinstalling existing shims that fell out, complete reassembly step 2. Otherwise, skip to reassembly step 3.

1. Slide the end of the replacement trackpad flex cable into the connector on the trackpad (1). Then flip down the locking lever (2).



2. Use ESD-safe tweezers to position the trackpad shims. Position four longer shims on the outer screw holes. Then position two smaller circular shims on the middle screw holes.



Important

A replacement trackpad comes with three sizes of shims (0.200 mm, 0.250 mm, and 0.300 mm). Start with the 0.250 mm shim. Use thinner or thicker shims to adjust alignment.

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3. Hold the battery cover by the edges and lift it off the top case.

4. Ensure that the trackpad lies flat on the table with the trackpad flex cable extended away from you.

Important

Ensure that the trackpad shims are positioned on the trackpad.

5. Route the trackpad flex cable back through the opening in the top case.



6. Slowly lower the computer over the trackpad and align the screw holes in the top case with the screw holes in the trackpad. Let the display hang over the table edge.

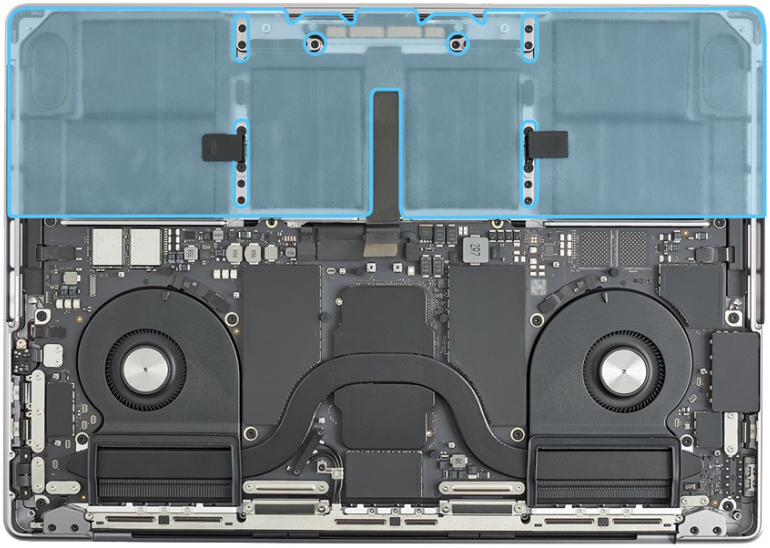
7. Lay the trackpad flex cable flat.

Important

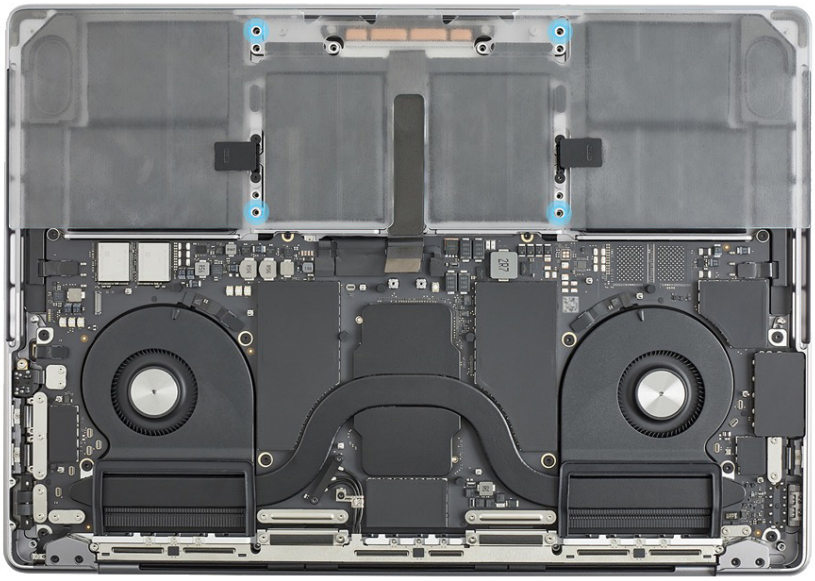
Don’t adhere the trackpad flex cable to the battery yet.

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8. Place the battery cover on the battery and press the black tabs into the clips on the top case until you feel a click.



9. Use the T5 screwdriver to partially reinstall the four outer T5 screws (923-06941) into the outer screw holes to align the trackpad.

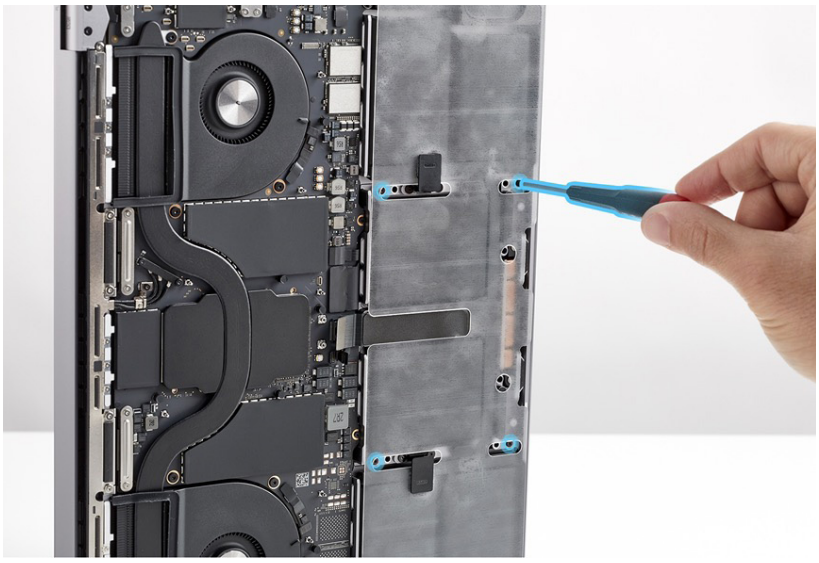


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10. Turn over the computer. Insert four gap offsets into the corners of the trackpad. Secure each gap offset with a piece of Kapton tape.



11. Stand the computer on its side with the display still open. Use the T5 screwdriver to fully tighten the four outer T5 screws.



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12. Place the computer right side up. To verify the top of the trackpad is at the correct height, align one sticky note on the trackpad's top edge. Ensure that the sticky note is flush with the top case.



13. To verify that the bottom of the trackpad is at the correct height, align a stack of two sticky notes on the trackpad's bottom edge. Ensure that the two sticky notes are flush with the top case.



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14. If the trackpad is at the correct height, continue to step 15. If the trackpad edges are higher or lower than the top case, remove the sticky notes, gap offsets, and Kapton tape. Place the computer on the edge of the table with the display hanging down. Use the T5 screwdriver to remove the four outer side T5 screws and repeat removal steps 2 through 6. Then follow reassembly steps 1 through 12.

Important

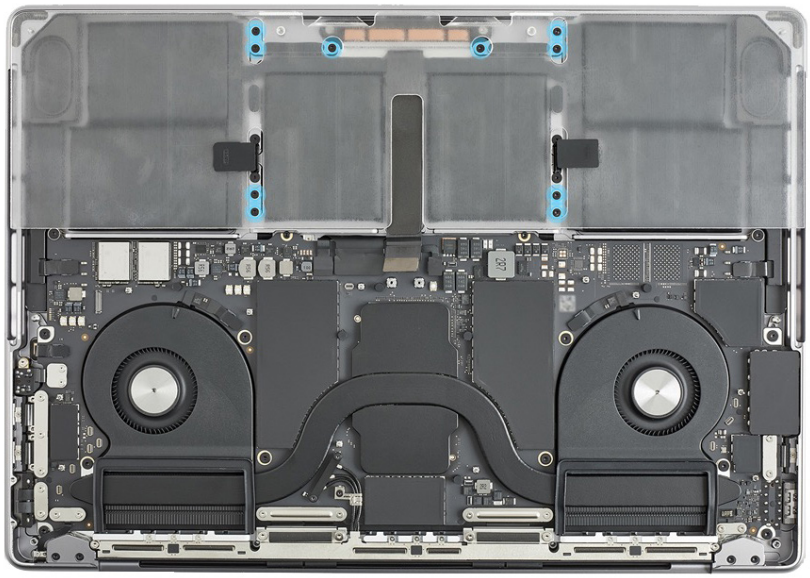
- If the trackpad is higher than the top case, install the thinner 0.200 mm shims.
- If the trackpad is lower than the top case, install the thicker 0.300 mm shims.

15. Place the computer on the edge of the table with the display hanging down.

16. Use the T5 screwdriver to reinstall the remaining six T5 screws (923-06941).

17. Insert the Torx T5 bit into the 10–34 Ncm adjustable torque driver. Set the torque value to 16 Ncm.

18. Use the 10–34 Ncm adjustable torque driver and T5 security bit to tighten all ten T5 screws to 16 Ncm. Turn each screw until the torque driver clicks.



19. Hold the battery cover by the edges and lift it off the top case.

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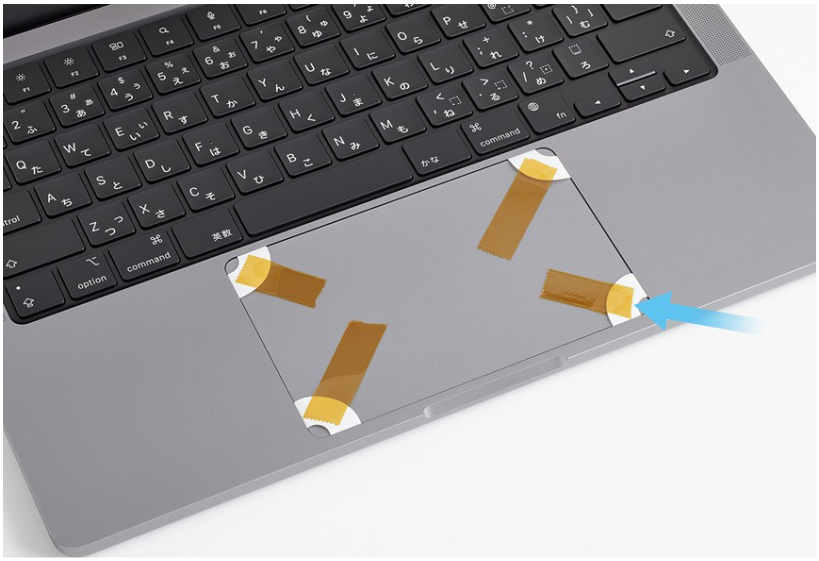
20. Gently press along the trackpad flex cable to adhere it to the battery.

Important

If installing a replacement trackpad flex cable, remove the adhesive backing before adhering the flex cable to the battery.

21. Place the battery cover on the battery and press the black tabs into the clips on the top case until you feel a click.

22. Turn the computer over. Insert the flat end of the black stick under the gap offsets to lift the gap offsets and Kapton tape off the trackpad.



Reinstall the following part to complete reassembly:

- Bottom case

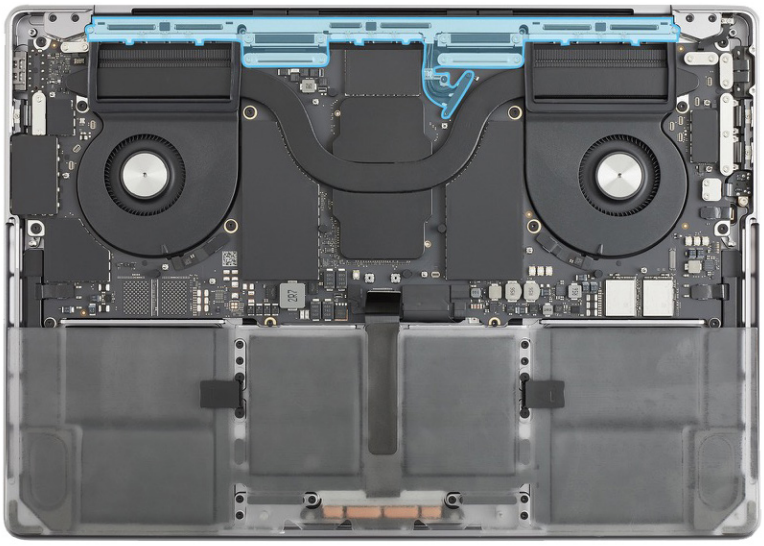
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Vent/Antenna Module

Before You Begin

Remove the following part before you begin:

- Bottom case



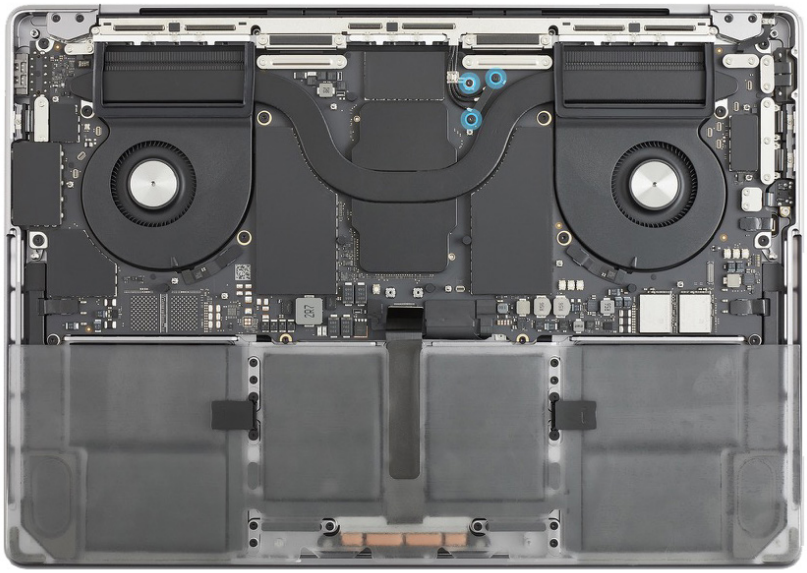
Tools

- Antenna tool
- ESD-safe tweezers
- Nylon probe (black stick)
- Torque driver (blue, 0.65 kgf cm)
- Torx security bit
- Torx T3 screwdriver
- Torx T5 screwdriver

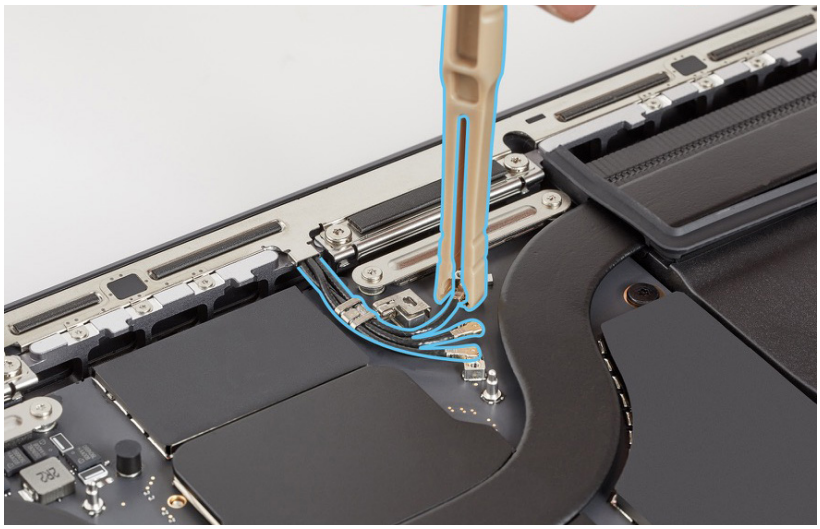
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Removal

1. Use the T3 screwdriver to remove one T3 screw (923-06851) from the antenna coaxial cable grounding clip and two T3 screws (923-06851) from the antenna coaxial cable cowling. Remove the cowling and save it for reassembly.

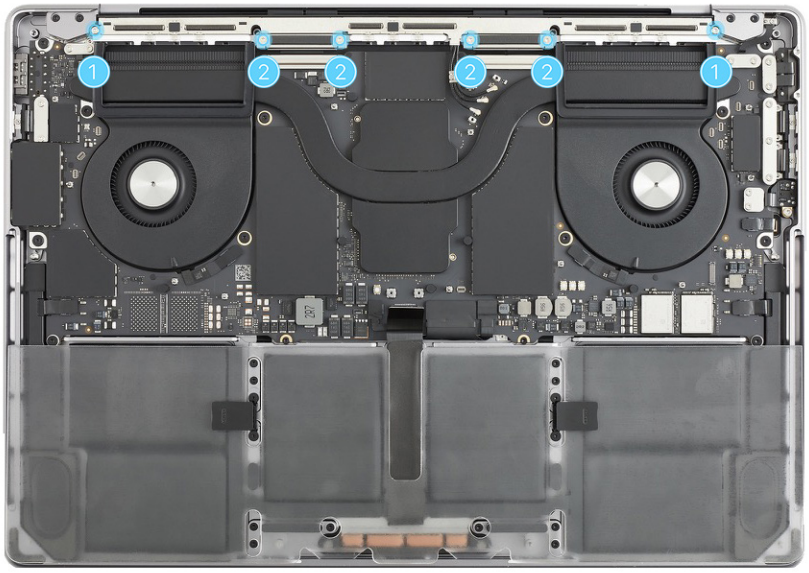


2. Use the antenna tool to lift the end of one antenna coaxial cable off the connector. Then repeat the process on the other two antenna coaxial cables.

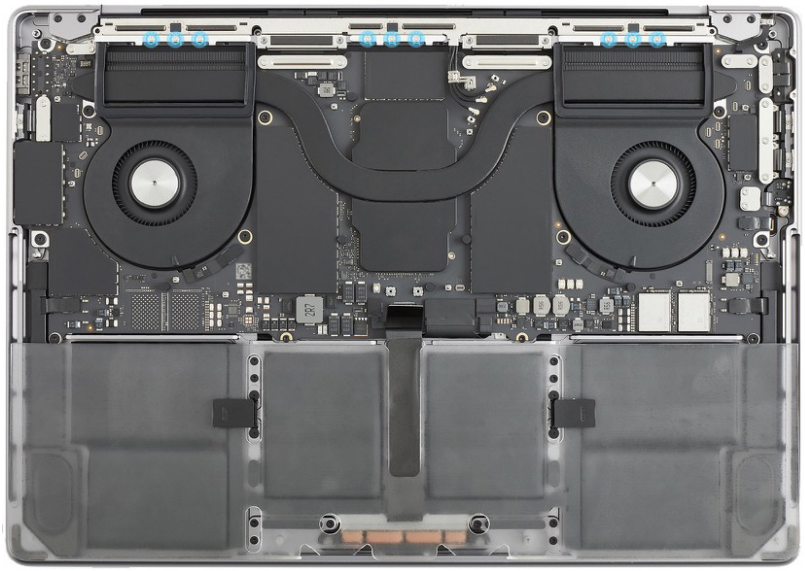


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3. Use the T5 screwdriver to remove the two long outer T5 screws (923-06850) (1) and the four short inner T5 screws (923-07032) (2) from the vent/antenna module.

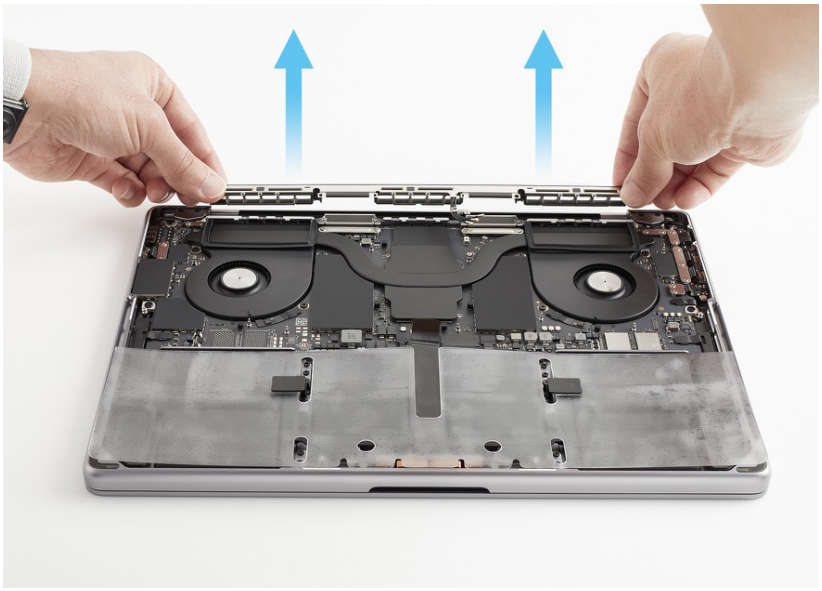


4. Use the blue torque driver and the Torx security bit to remove the nine 1IPR screws (923-07033) from the vent/antenna module.



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5. Lift the vent/antenna module out of the top case as shown.

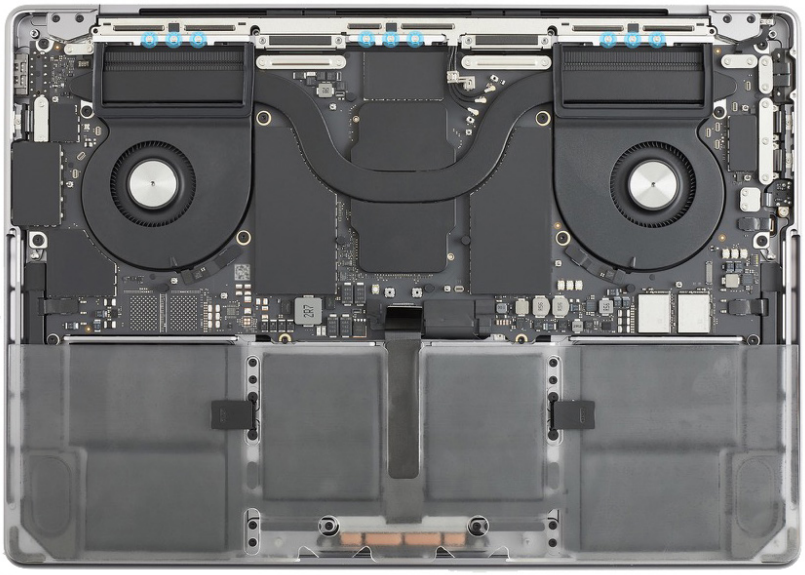


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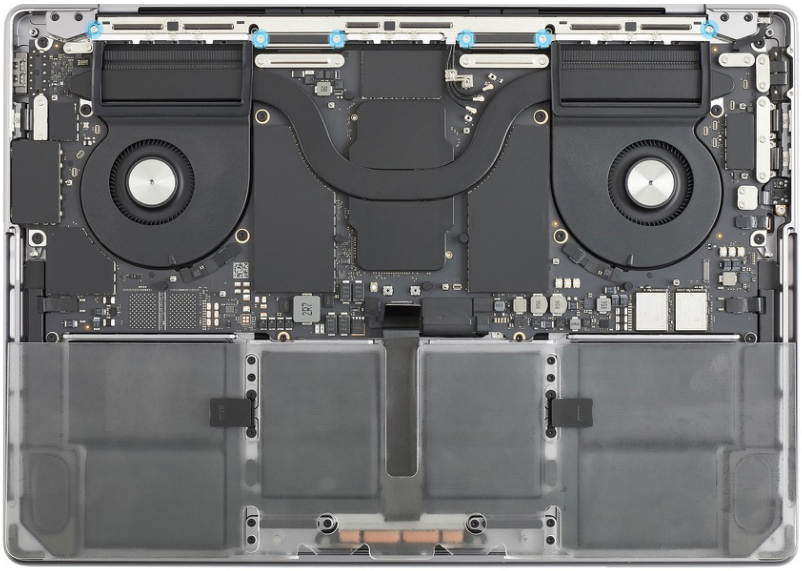
Reassembly

1. Position the vent/antenna module in the top case.

2. Use the blue torque driver and the Torx security bit to reinstall the nine 1IPR screws (923-07033) into the vent/antenna module. Tighten each screw until the torque driver clicks.

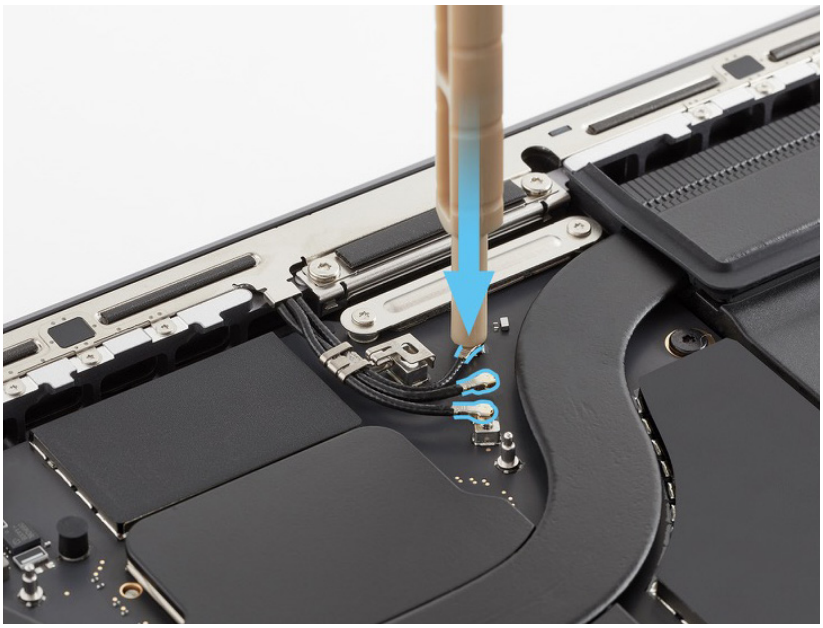


3. Use the T5 screwdriver to reinstall two outer T5 screws (923-06850) and four middle T5 screws (923-07032).



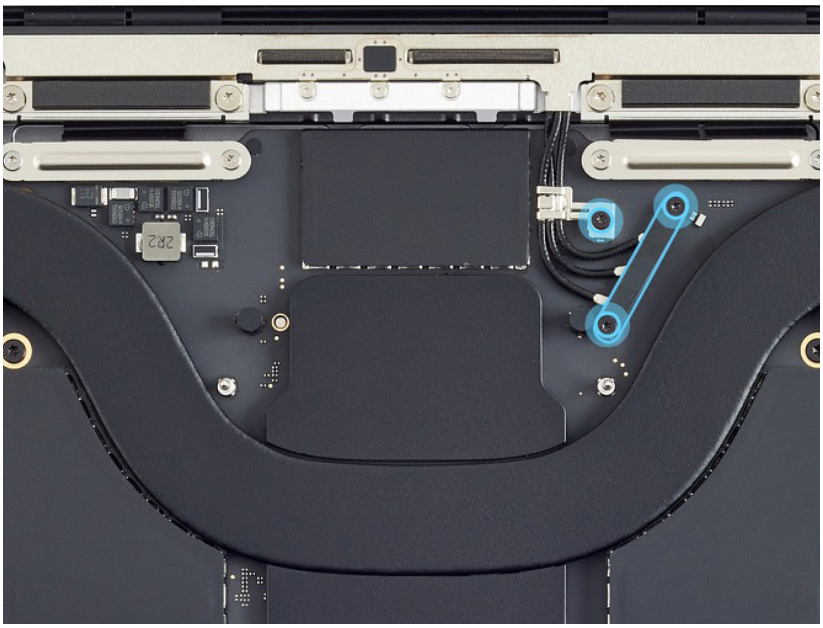
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4. Position the ends of the antenna coaxial cables over the connectors. Use the blunt end of the antenna tool to press the ends of the antenna coaxial cables to the connectors.



5. Position the antenna coaxial cable cowling over the ends of the antenna coaxial cables.

6. Use the T3 screwdriver to reinstall one T3 screw (923-06851) into the antenna coaxial cable grounding clip and two T3 screws (923-06851) into the antenna coaxial cable cowling.



Reinstall the following part to complete reassembly:

- Bottom case

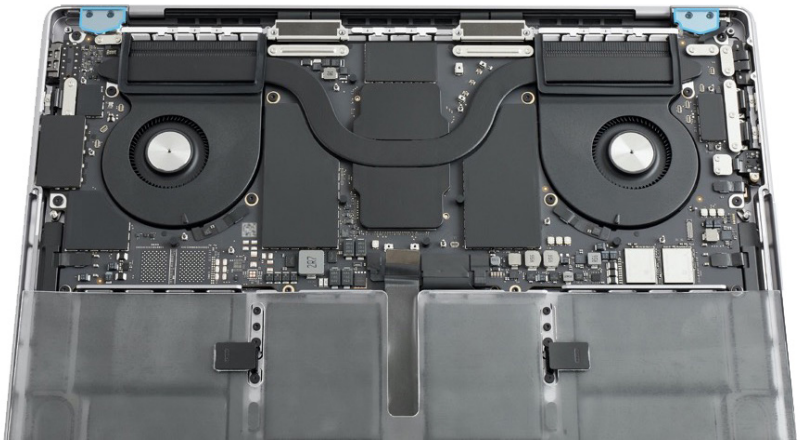
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Display Hinge Covers

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module



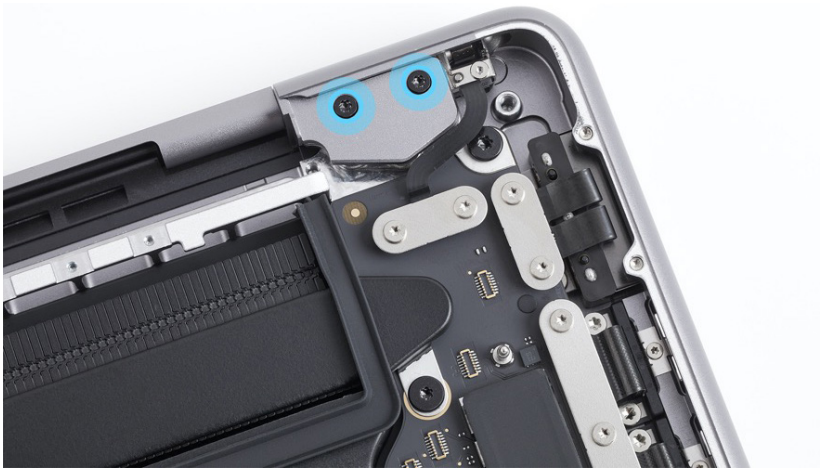
Tools

- ESD-safe tweezers
- Nylon probe (black stick)
- Torx T5 screwdriver

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Removal

1. Use the T5 screwdriver to remove the two T5 screws (923-06853) from each display hinge cover.



2. Use the black stick or ESD-safe tweezers to remove the two display hinge covers from the top case.



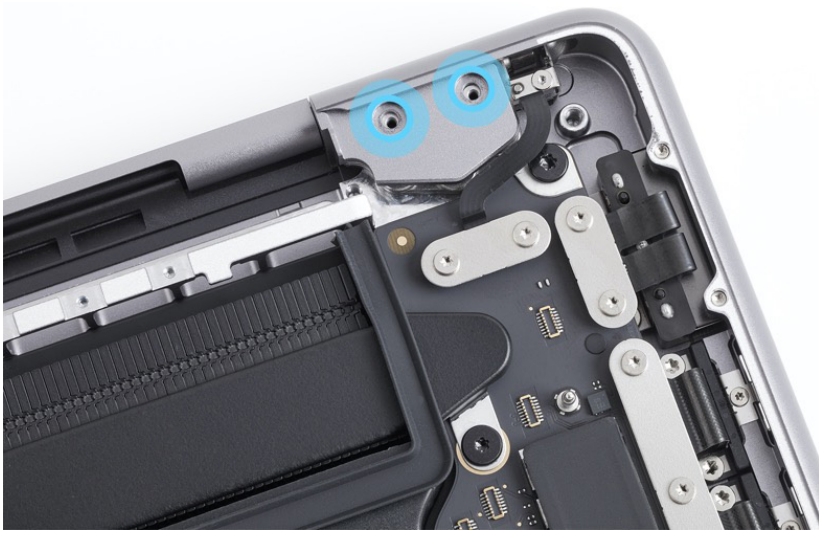
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Reassembly

1. Use the ESD-safe tweezers to position the two display hinge covers in the top case.



2. Use the T5 screwdriver to reinstall the two T5 screws (923-06853) into each display hinge cover.



Reinstall the following parts to complete reassembly:

- Vent/antenna module
- Bottom case

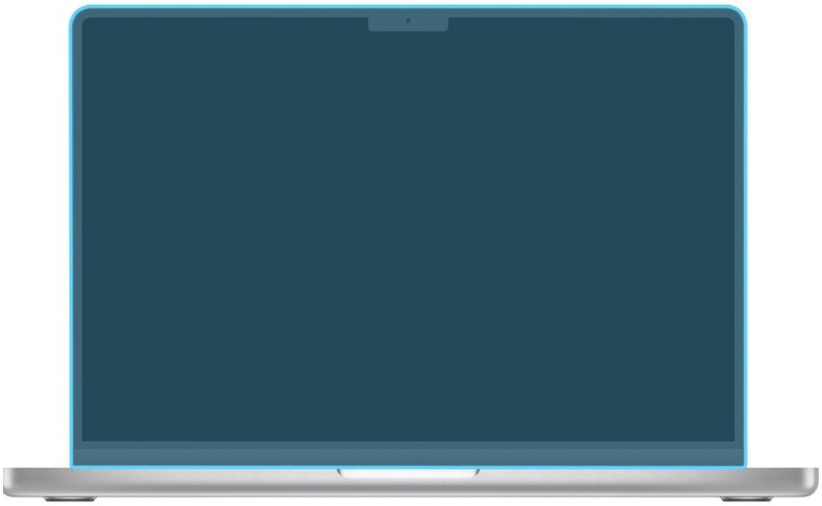
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Display

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Display hinge covers
- Lid angle sensor



Tools

- Nylon probe (black stick)
- Torx T3 screwdriver
- Torx T8 screwdriver

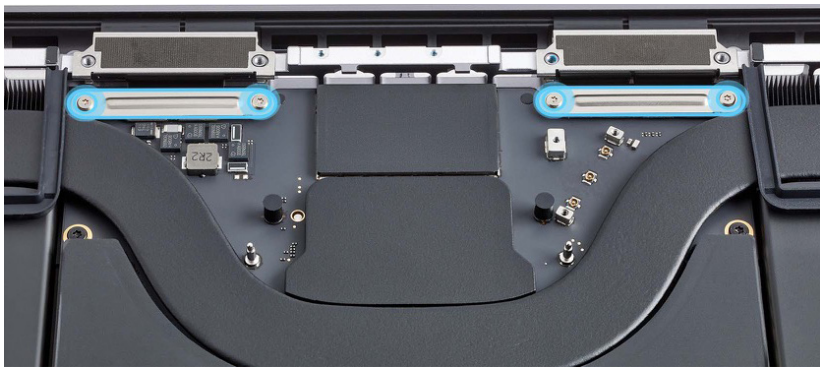
Important

- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- If you replace the display, you must also replace the lid angle sensor.

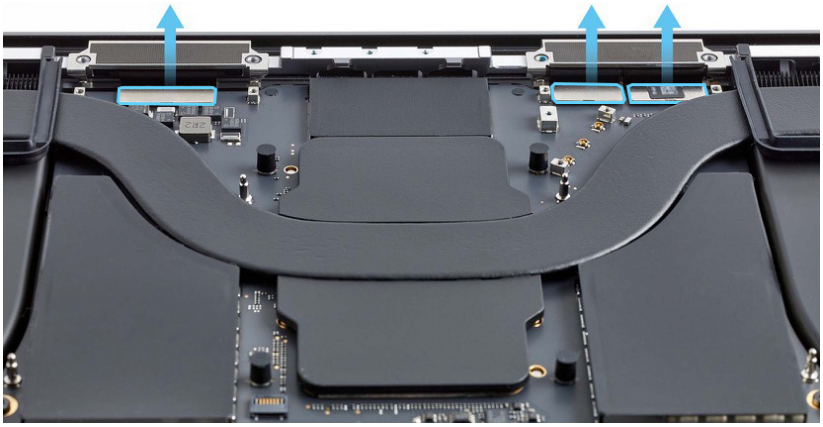
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Removal

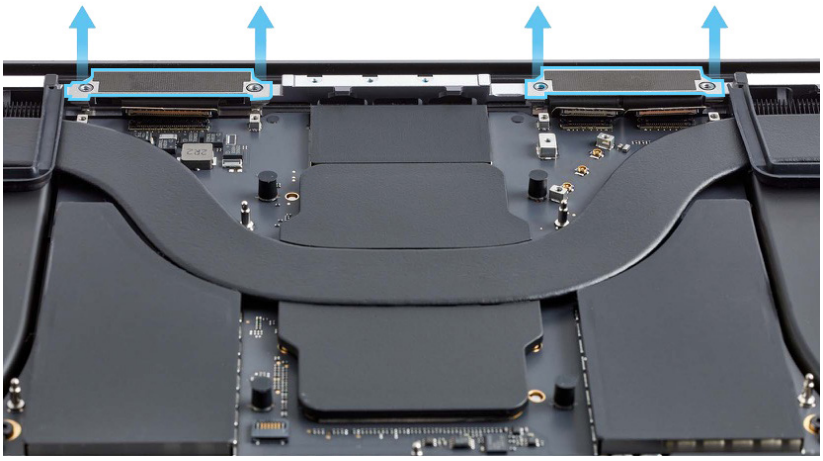
1. Use the T3 screwdriver to remove the four T3 screws (923-06854) from the two display connector cowlings. Remove the cowlings and save them for reassembly.



2. Lift the ends of the display backlight power flex cable, FaceTime HD camera flex cable, and eDP flex cable off the connectors.

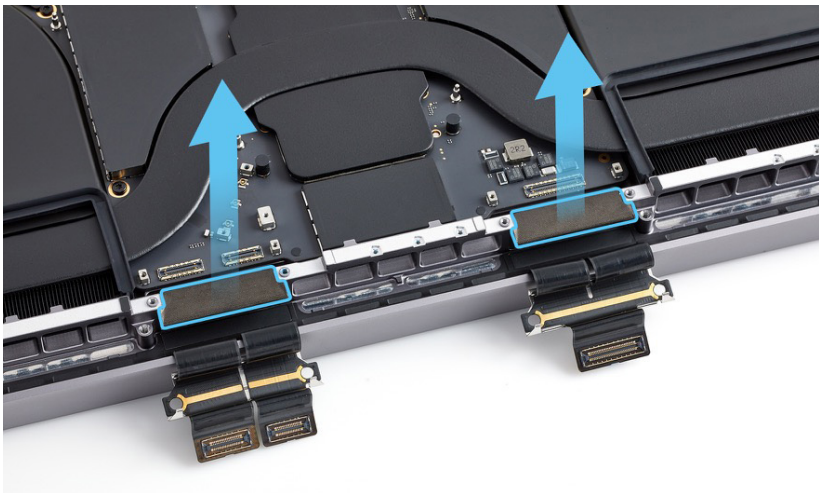


3. Lift the display cable clips off the internal frame of the top case. Gently fold them back over the edge of the top case to reveal the display cable bumpers underneath.



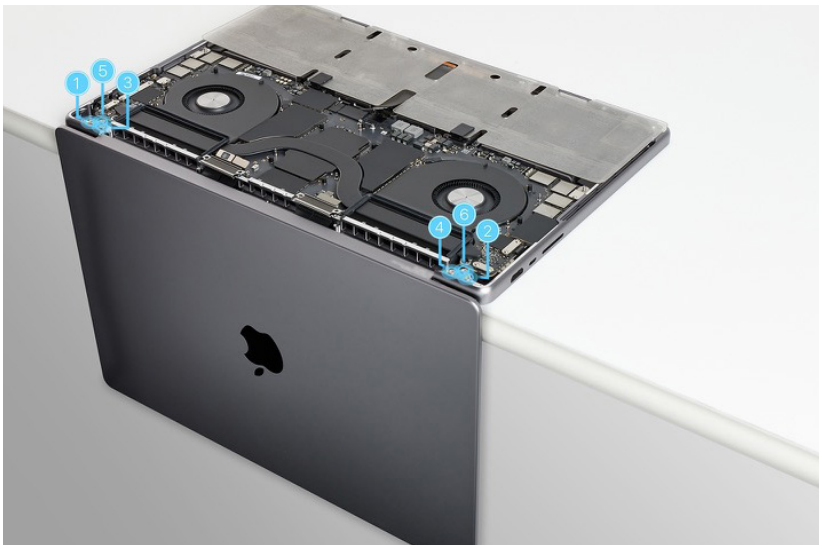
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4. Lift the display cable bumpers out of the top case. Save them for reassembly.



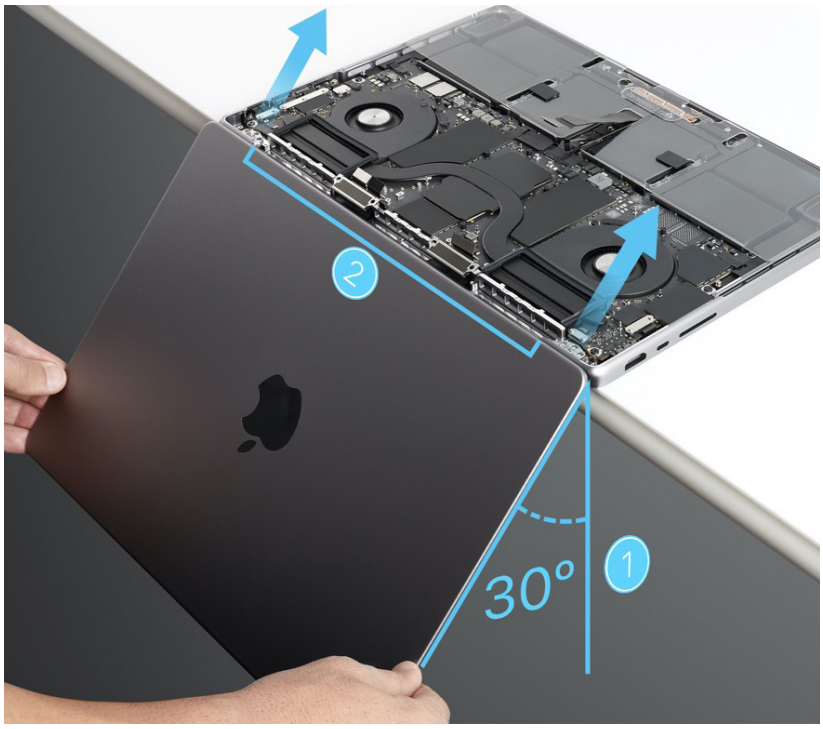
5. Open the computer and place it facedown on a clean surface with the display hanging down over the edge of the table.

6. Use the T8 screwdriver to remove the six T8 screws (923-07042) from the display hinges in the order shown.



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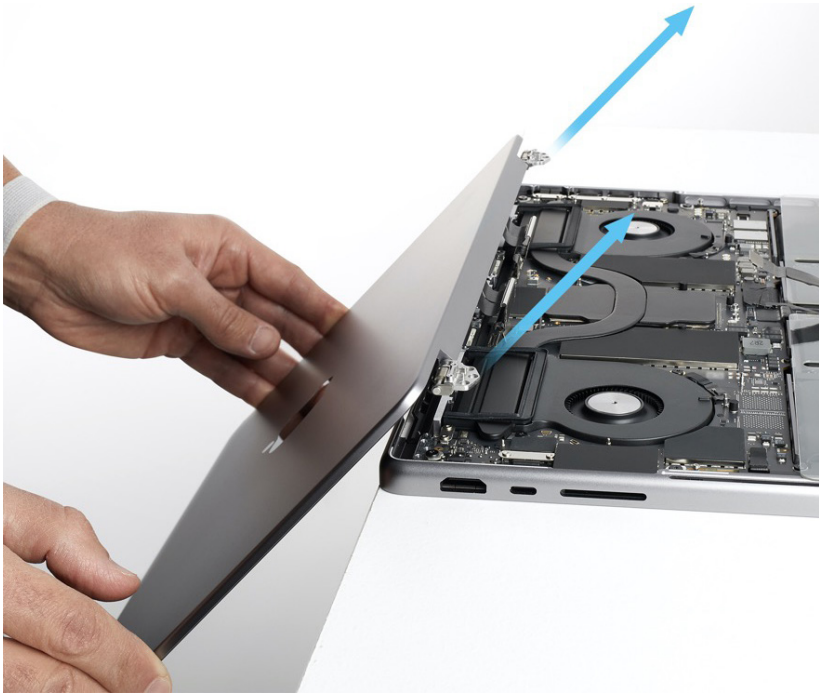
7. Pull the display toward you about 30 degrees (1). Then lift the display up and ensure that the hinges clear the edge of the top case (2).





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8. Remove the display from the top case as shown.



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Reassembly

Important

- If you're installing a replacement display, begin at step 1. Ensure that you remove all protective liners and tape from a replacement display.
- If you're reinstalling the existing display, skip to reassembly step 2.

1. Remove the existing lid angle sensor and install a replacement lid angle sensor.

2. Position the display in the top case as shown.



3. Use the T8 screwdriver to partially reinstall the six T8 screws (923-07042) into the display hinges in the order shown.



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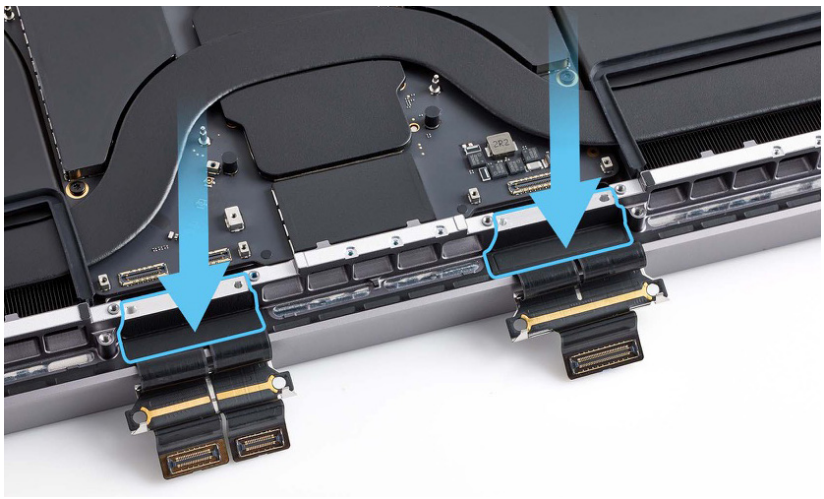
4. Close the display and stand the computer on its edge. Adjust the display until it's flush with the top case.



5. Place the computer facedown with the rear edge closest to you.

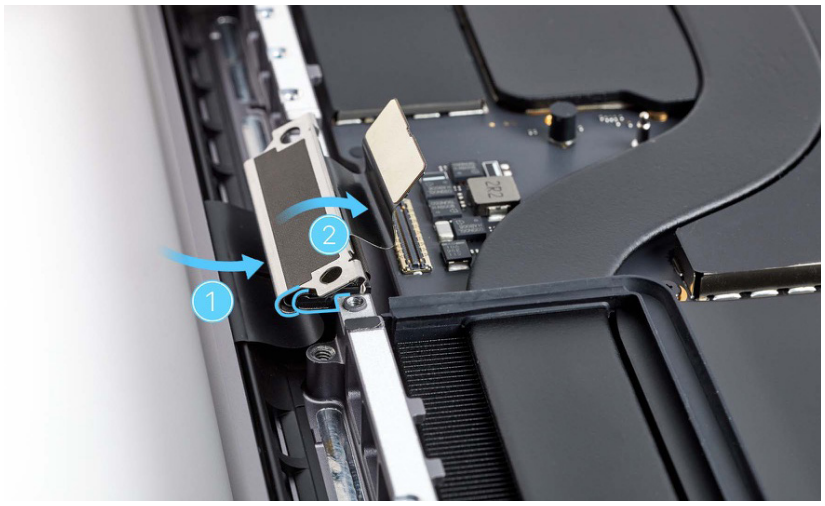
6. Use the T8 screwdriver to fully reinstall the six T8 screws into the display hinges.

7. Position the display cable bumpers in the internal frame.



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8. Align the display flex cables around the edge of the display cable bumpers (1). Then press the display flex cable clips down over the bumpers and onto the internal frame (2).

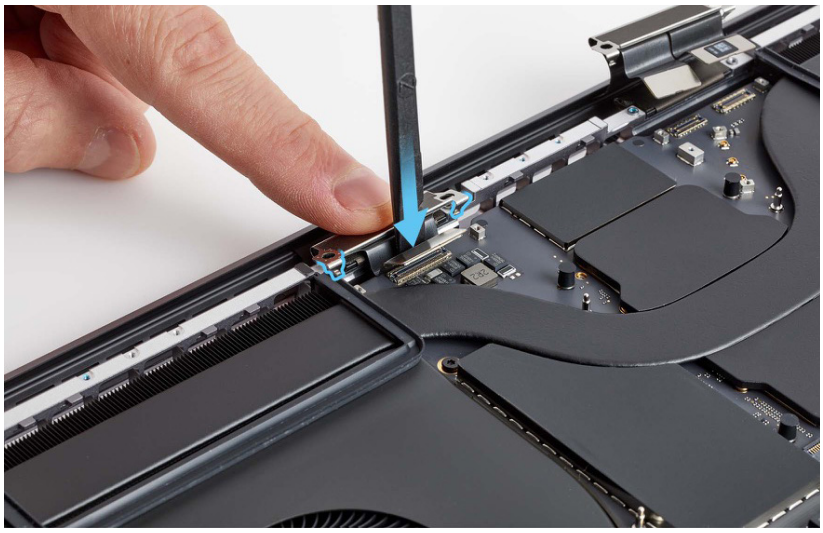


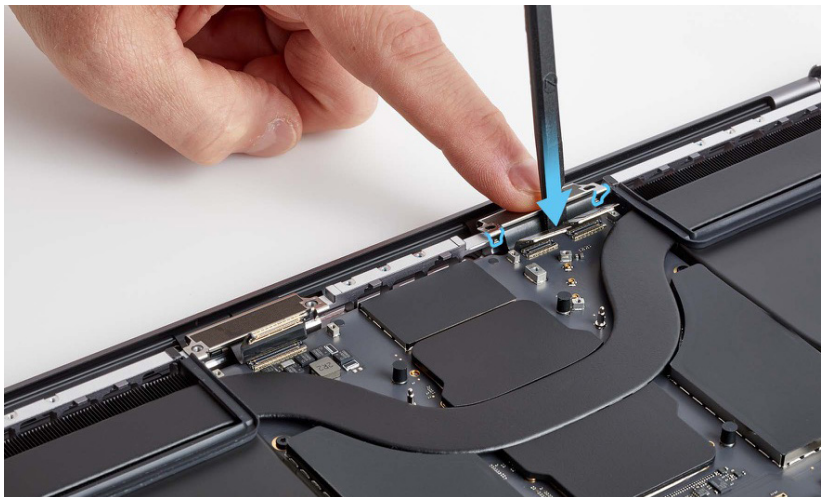
9. Use the black stick to tuck the display flex cables into the gap between the display and internal frame.



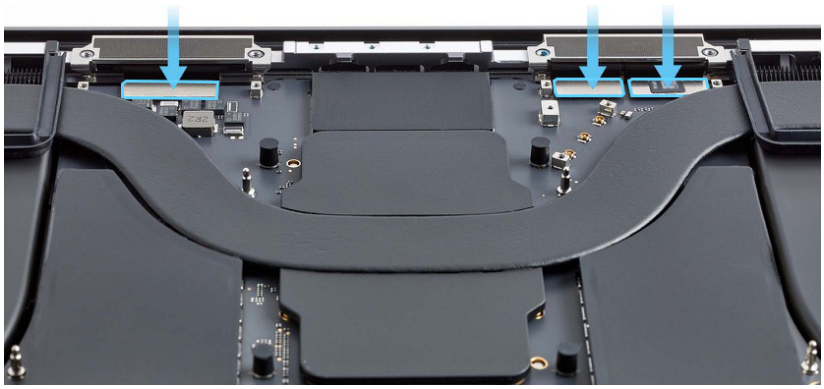
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10. Use the black stick to tuck each display flex cable into the gap between the logic board and the internal frame. Ensure that the display flex cable clips are fully clipped onto the internal frame.



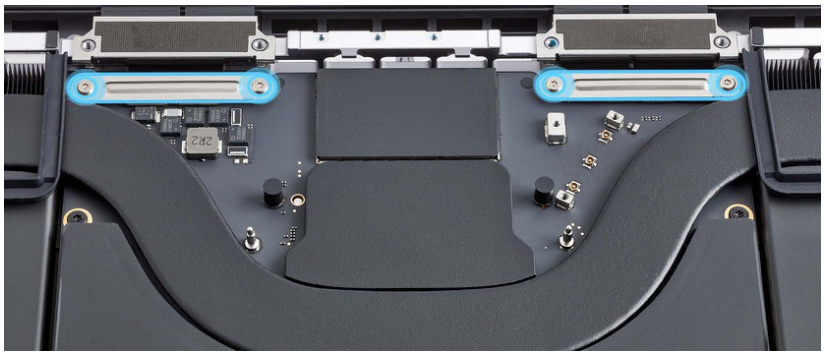


11. Press the ends of the display backlight power flex cable, FaceTime HD camera flex cable, and eDP flex cable to their connectors on the logic board.



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12. Position the two display connector cowlings over the ends of the display backlight power flex cable, FaceTime camera cable, and eDP flex cable connectors. Then use the T3 screwdriver to reinstall two T3 screws (923-06854) into each of the cowlings.



Reinstall the following parts to complete reassembly:

- Display hinge covers
- Vent/antenna module
- Bottom case

Important

After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

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Logic Board

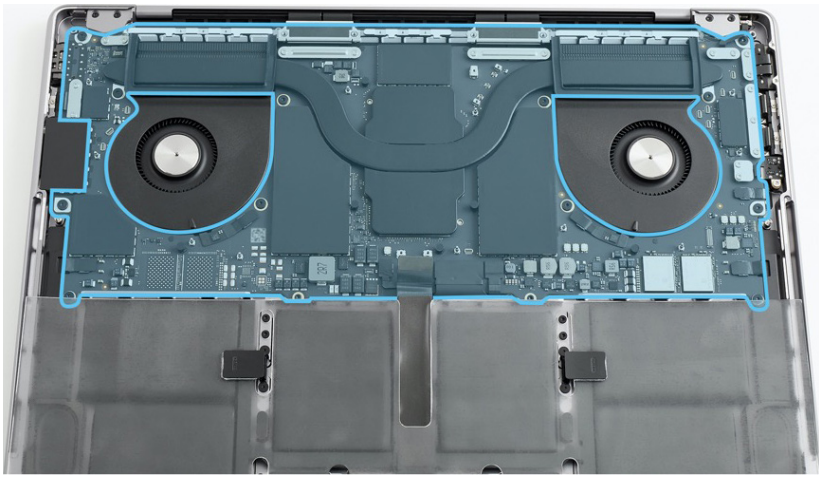
Before You Begin

Warning

Read Battery Safety and follow workspace and battery handling guidelines before you begin.

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module



Tools

- #00 Phillips screwdriver
- ESD-safe tweezers
- Kapton tape
- Nylon probe (black stick)
- Torx T3 screwdriver
- Torx T5 screwdriver
- Torx T6 screwdriver

Important

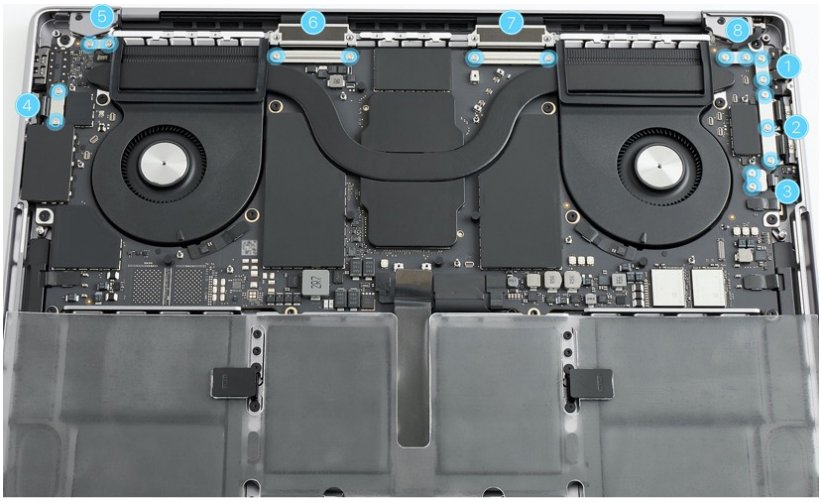
- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- If you're installing a replacement logic board, you must also install a replacement Touch ID board.

Note: Your logic board and heat sink may look different, but the procedure is the same.

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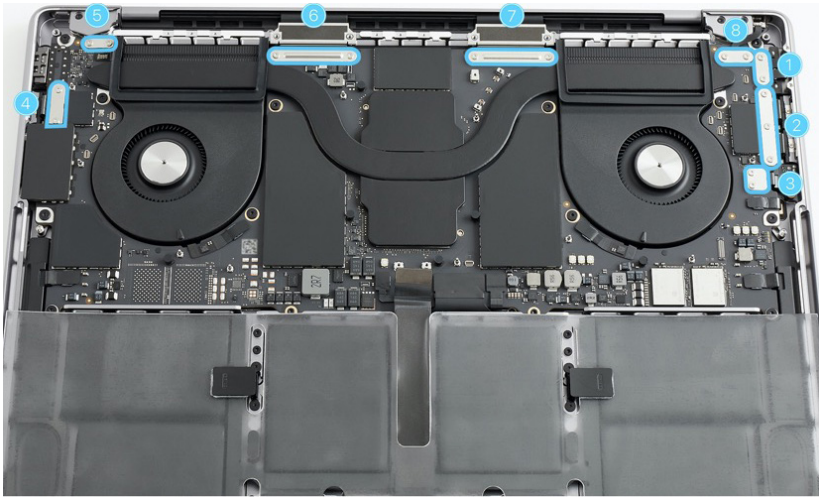
Removal

1. Use the T3 screwdriver to remove the following 17 screws:
 - Two T3 screws (923-06959) from the MagSafe 3 board connector cowling (1)
 - Three T3 screws (923-06938) from the left USB-C boards connector cowling (2)
 - Two T3 screws (923-06854) from the audio board connector cowling (3)
 - Two T3 screws (923-06938) from the right USB-C board connector cowling (4)
 - Two T3 screws (923-07046) from the Touch ID board connector cowling (5)
 - Two T3 screws (923-06854) from the display connector cowling (6)
 - Two T3 screws (923-06854) from the display connector cowling (7)
 - Two T3 screws (923-06854) from the lid angle sensor connector cowling (8)

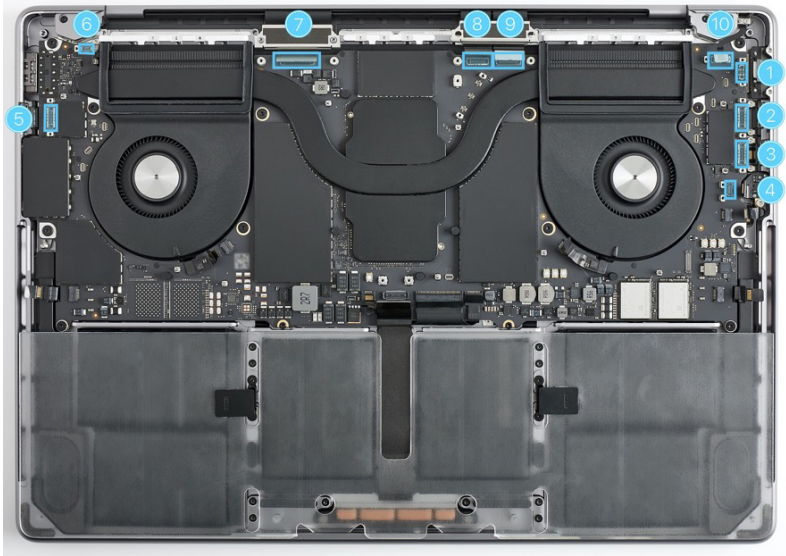


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2. Remove the following eight cowlings and save them for reassembly:
 - MagSafe 3 board connector cowling (1)
 - Left USB-C boards connector cowling (2)
 - Audio board connector cowling (3)
 - Right USB-C board connector cowling (4)
 - Touch ID board connector cowling (5)
 - Display connector cowling (6)
 - Display connector cowling (7)
 - Lid angle sensor connector cowling (8)

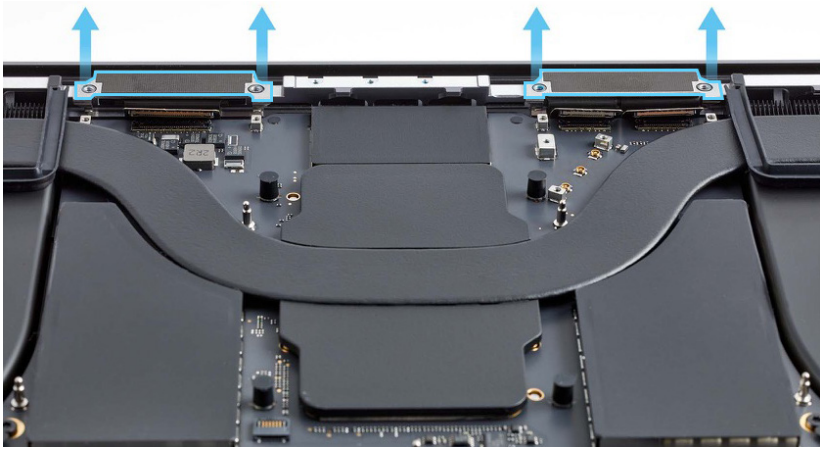


3. Lift the ends of the following ten flex cables off the connectors on the logic board:
 - MagSafe power module flex cable (1)
 - Left USB-C board flex cables (2, 3)
 - Audio board flex cable (4)
 - Right USB-C board flex cable (5)
 - Touch ID board flex cable (6)
 - Display backlight power flex cable (7)
 - FaceTime HD camera flex cable (8)
 - eDP flex cable (9)
 - Lid angle sensor flex cable (10)



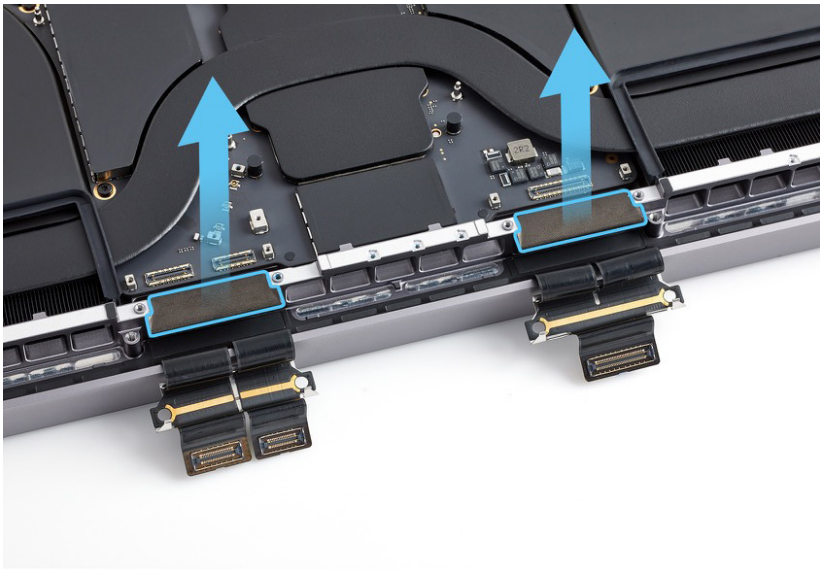
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4. Lift the display flex cable clips off the internal frame of the top case. Gently fold them back to reveal the black bumpers underneath.



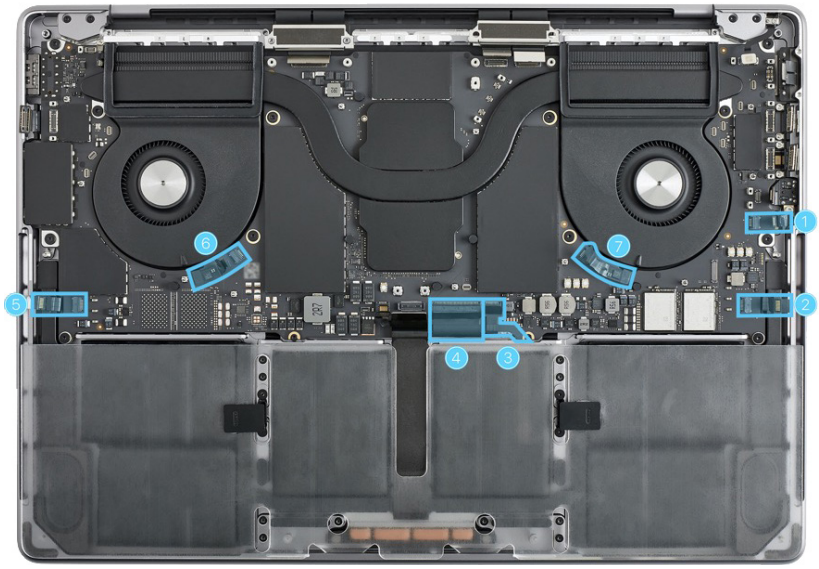
5. Rotate the top case as shown.

6. Lift the black bumpers out of the top case and save them for reassembly.

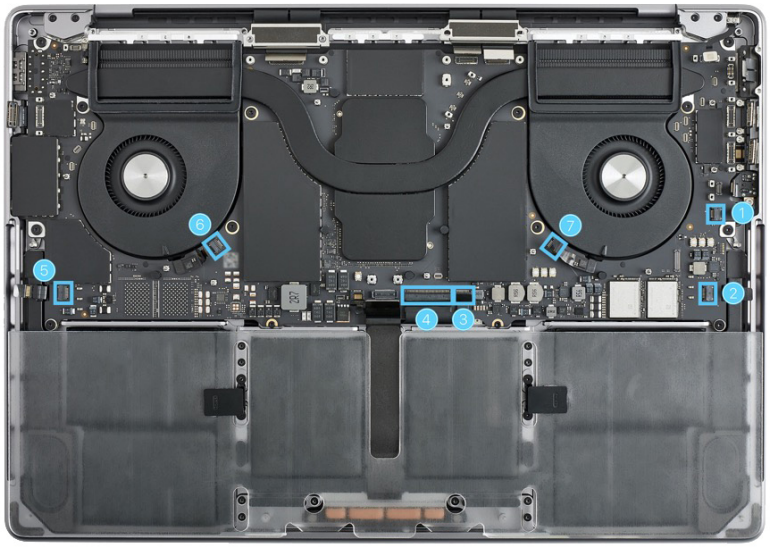


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7. Peel the polyester film tabs from the following seven flex cables:
 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)

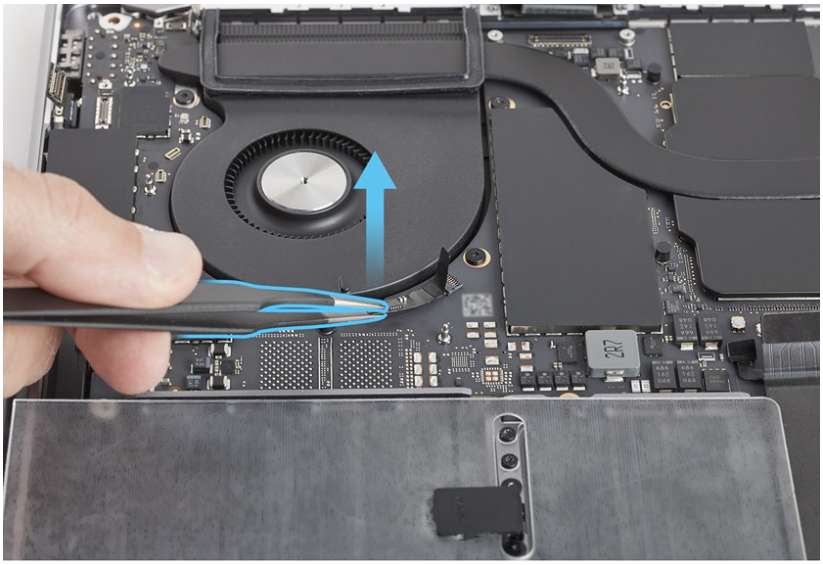


8. Use the black stick to flip up the locking levers of the following seven flex cables:
 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)



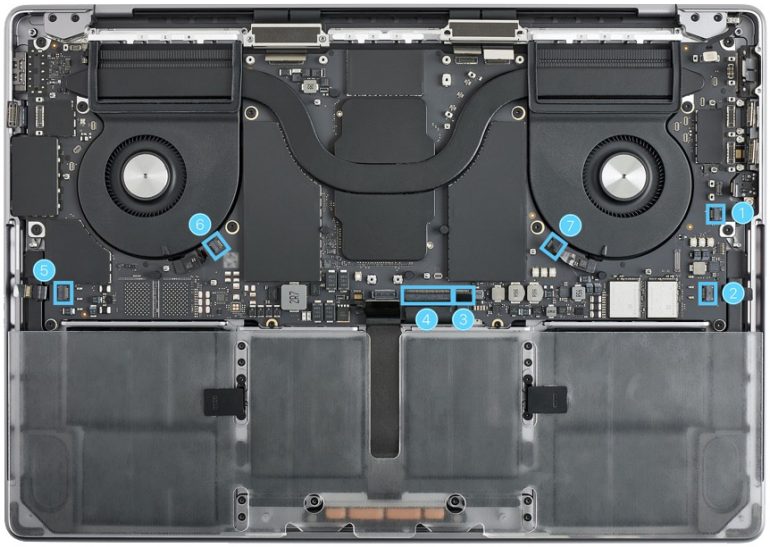
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9. Use ESD-safe tweezers to loosen the adhesive and peel the left and right fan flex cables from the logic board.



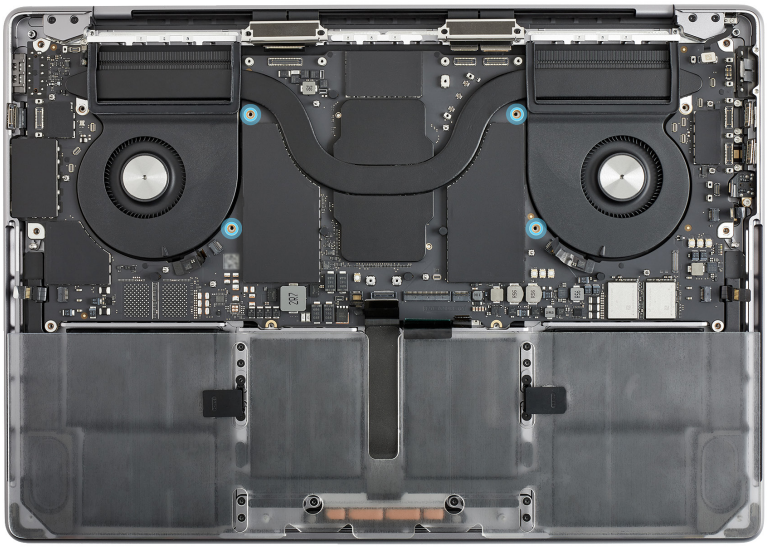
10. Slide the ends of the following seven flex cables from their connectors:

 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)



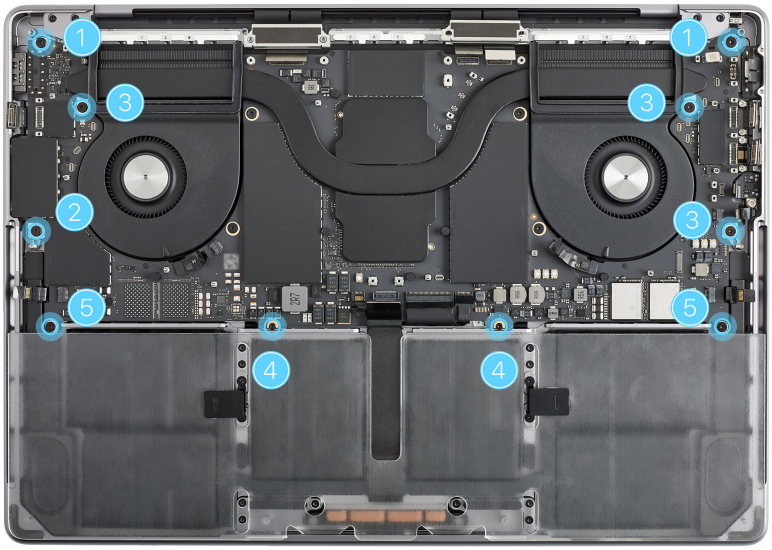
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11. Use ESD-safe tweezers to remove the polyester film covers from the four T5 screws. Save the covers for reassembly. Then use the T5 screwdriver to remove the four T5 screws (923-07039).



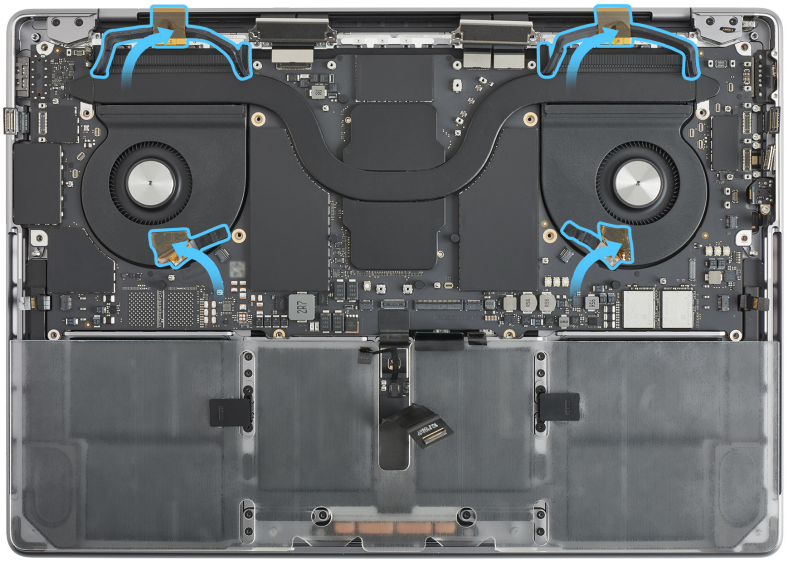
12. Use the T6 screwdriver to remove the following three screws from the logic board in the order shown:
 - Two T6 screws (923-07035) (1)
 - One T6 screw (923-07036) (2)

13. Use the T5 screwdriver to remove the following seven screws from the logic board in the order shown:
 - Three T5 screws (923-07040) (3)
 - Two T5 screws (923-07038) (4)
 - Two T5 screws (923-07037) (5)

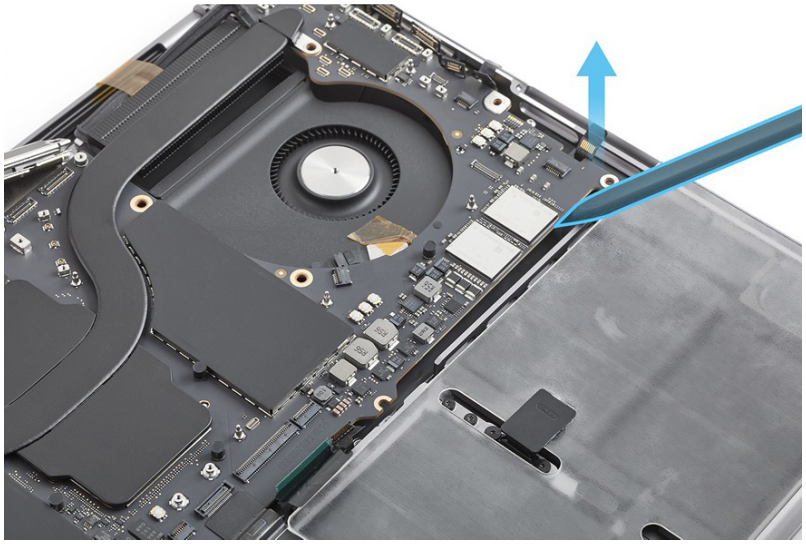


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14. Fold back the thermal duct covers and fan flex cables. Use Kapton tape to hold them back as shown.

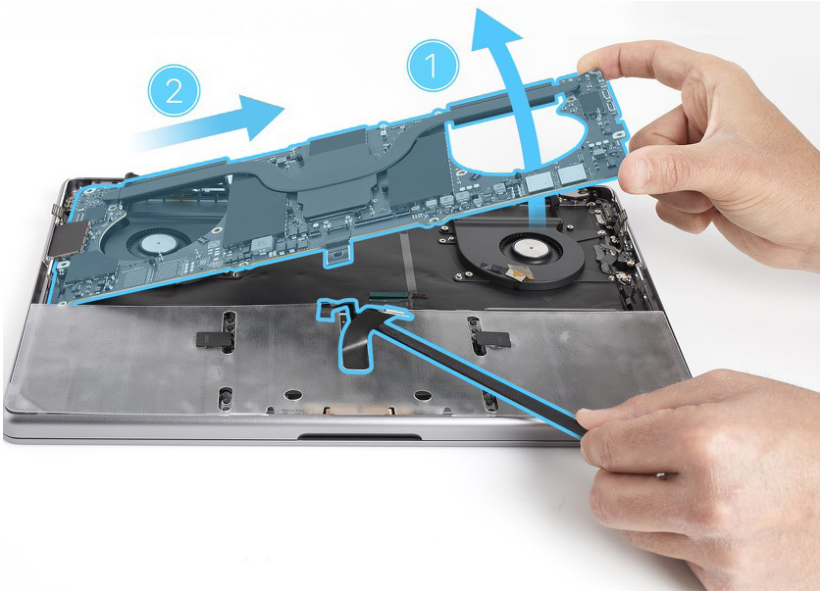


15. Use the black stick to slightly lift the edge of the logic board as shown.



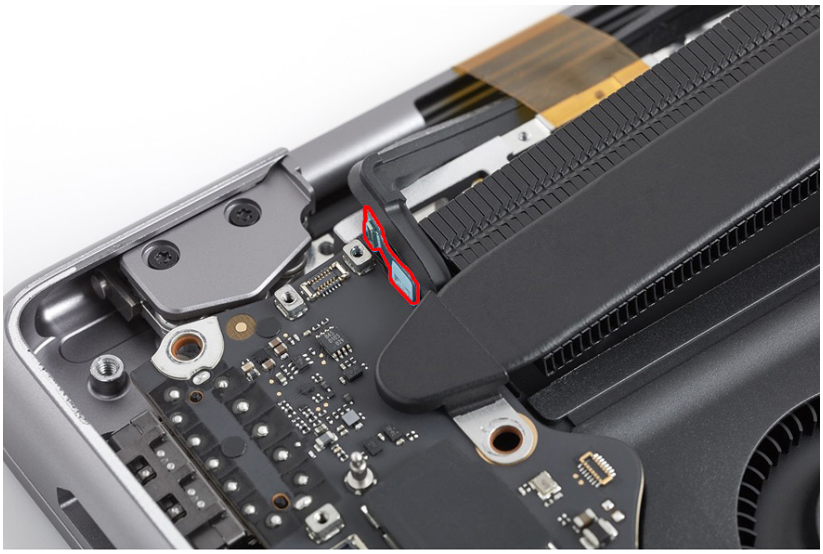
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16. Gently tilt up the logic board as shown (1). Then slide the logic board out of the top case (2). Use the black stick to fold back the trackpad and BMU flex cables as you remove the logic board.



Caution

Don’t damage the Touch ID board flex cable as you remove the logic board.



Important

Don’t remove the heat sink from the logic board.

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Reassembly

Important

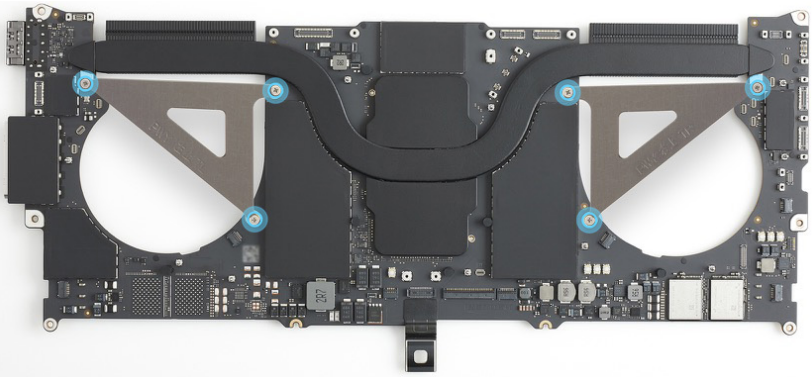
If you're reinstalling the existing logic board, skip to reassembly step 11. If you're installing a replacement logic board, continue to reassembly step 1.

Caution

If you're installing a replacement logic board, don't discard the packaging and stiffeners. The packaging and stiffeners must be transferred to the existing logic board before returning to Apple Service to prevent damage during shipping.

1. Follow the removal and reassembly steps to install a replacement Touch ID board.

2. Use the Phillips #00 screwdriver to fully loosen the six captive Phillips #00 screws from the top stiffeners on the replacement logic board.



3. Lift the top stiffeners off the replacement logic board and set them aside.

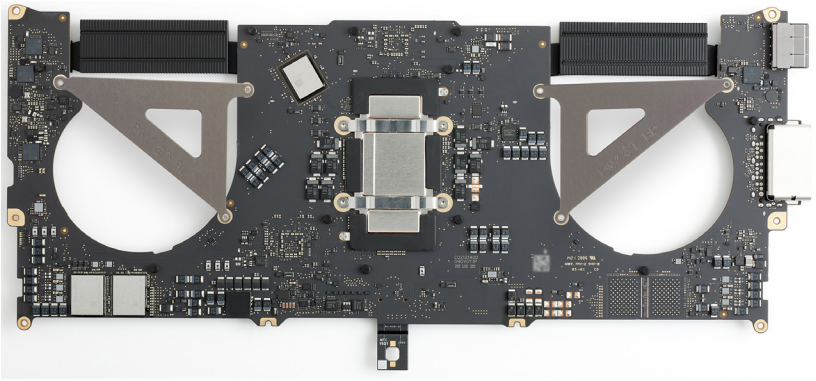
4. Lift the replacement logic board off the bottom stiffeners and set it aside.

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5. Position the existing logic board over the bottom stiffeners. Align the screw holes in the existing logic board with the screw holes in the bottom stiffeners.

 Note: The bottom stiffeners are marked with the following:

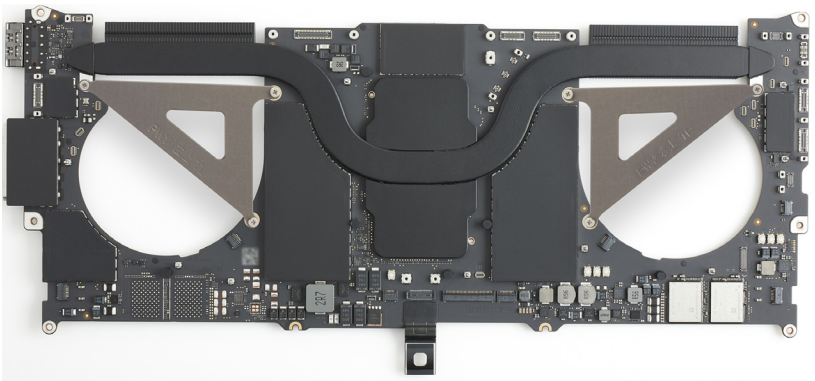
 - BL (bottom left)
 - BR (bottom right)



6. Position the top stiffeners on the existing logic board. Align the screw holes in the top stiffeners with the screw holes in the existing logic board.

 Note: The top stiffeners are marked with the following:

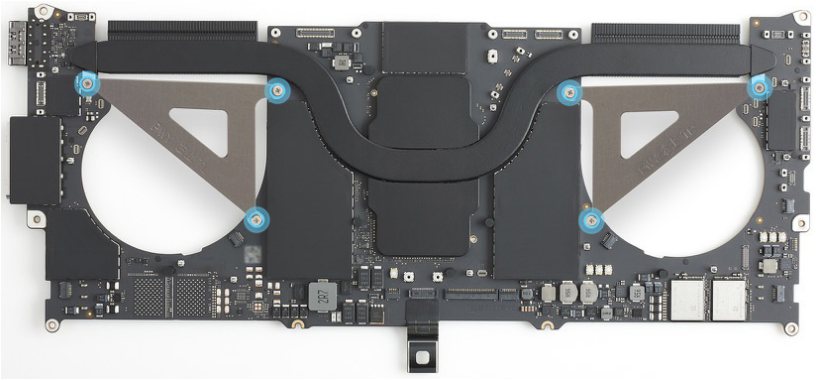
 - TL (top left)
 - TR (top right)



Important

The captive screws in the top stiffeners install through the screw holes of the logic board and into the screw holes in the bottom stiffeners.

7. Use the Phillips #00 screwdriver to fully tighten the six captive Phillips #00 screws into the four stiffeners.



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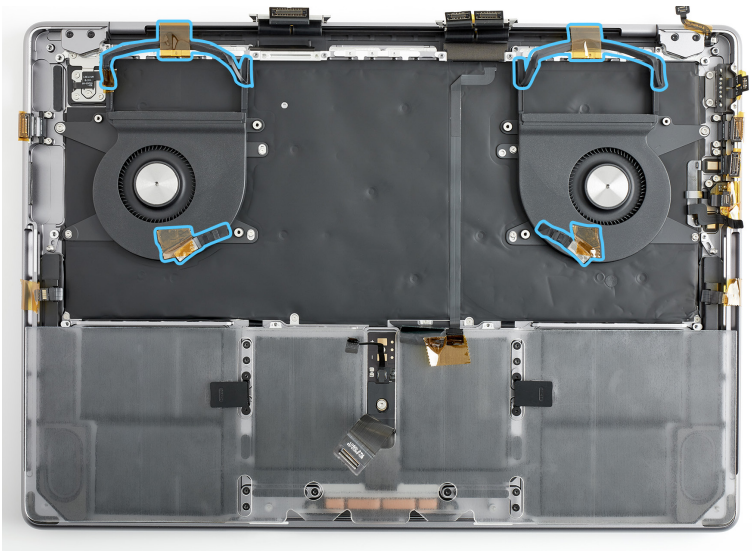
8. Place the existing logic board inside the reused ESD-safe packaging.

9. Position the packaged board in the foam frame.



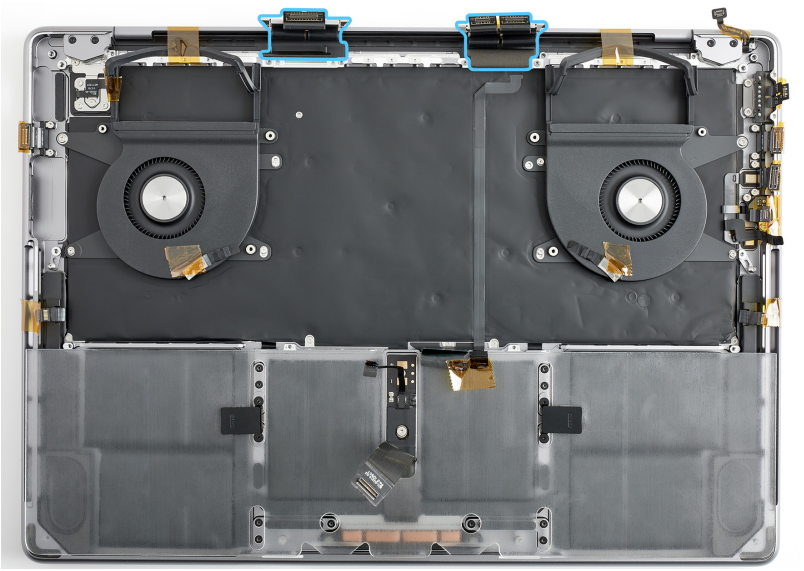
10. Close and seal the box. Ship the box to Apple Service.

11. Ensure that the thermal duct covers and fan flex cables are folded back and secured to the top case with Kapton tape.

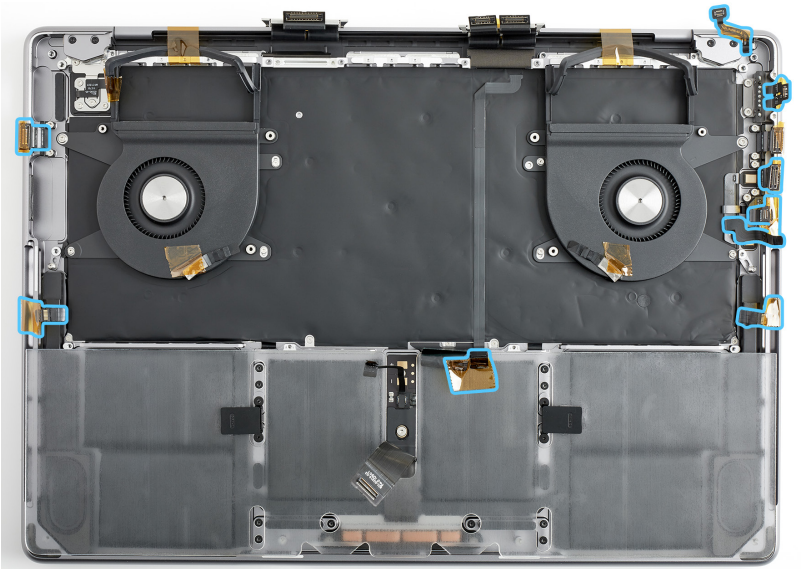


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12. Ensure that the display backlight power flex cable and FaceTime HD camera and eDP flex cable are folded back over the edge of the top case.

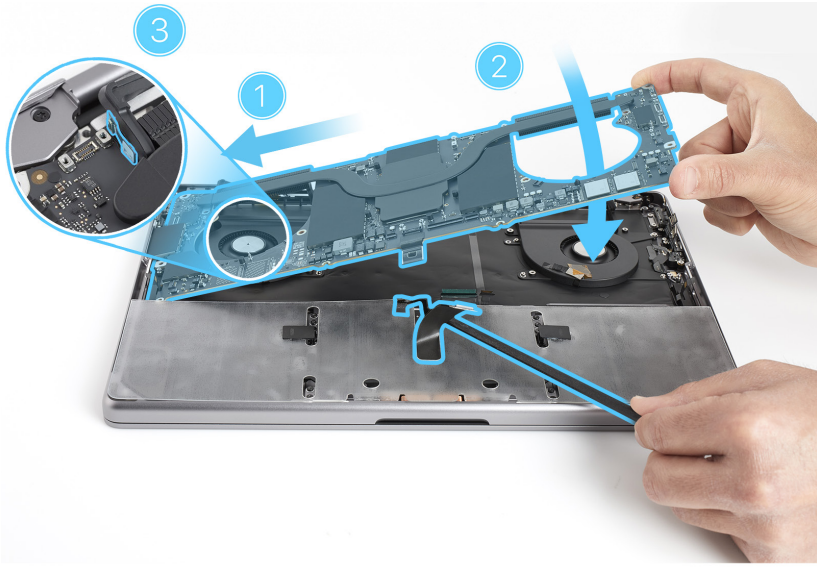


13. Fold back the following nine flex cables and secure them to the top case with Kapton tape as shown:
 - Right USB-C board flex cable
 - Right speaker flex cable
 - Keyboard backlight flex cable
 - Lid angle sensor flex cable
 - MagSafe power module flex cable
 - Left USB-C board flex cables
 - Audio board flex cable
 - Microphone flex cable
 - Left speaker flex cable



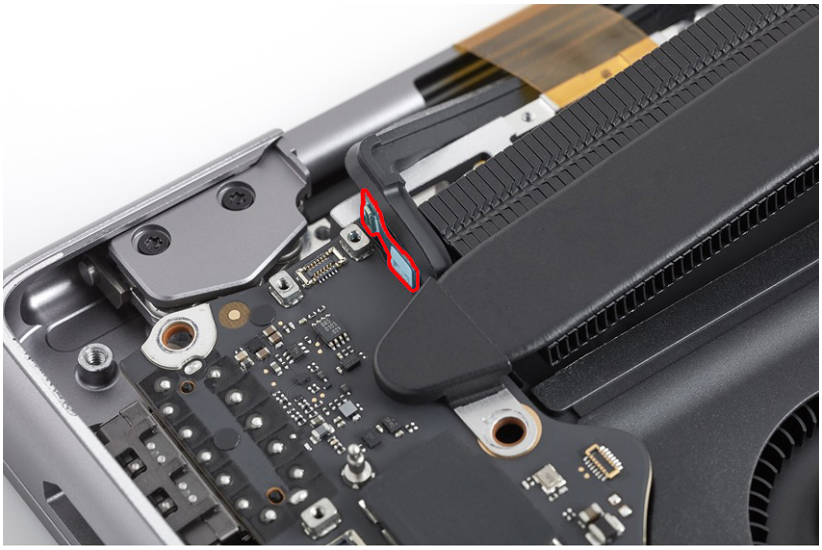
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14. Hold the logic board by the edges. Tilt down the edge of the logic board to position it in the top case (1). Then lower the logic board into the top case (2). Guide the Touch ID board flex cable through the gap between the thermal module and logic board (3).



Caution

- Don't damage the Touch ID board flex cable as you position the logic board.
- Ensure that no flex cables are caught under the logic board.

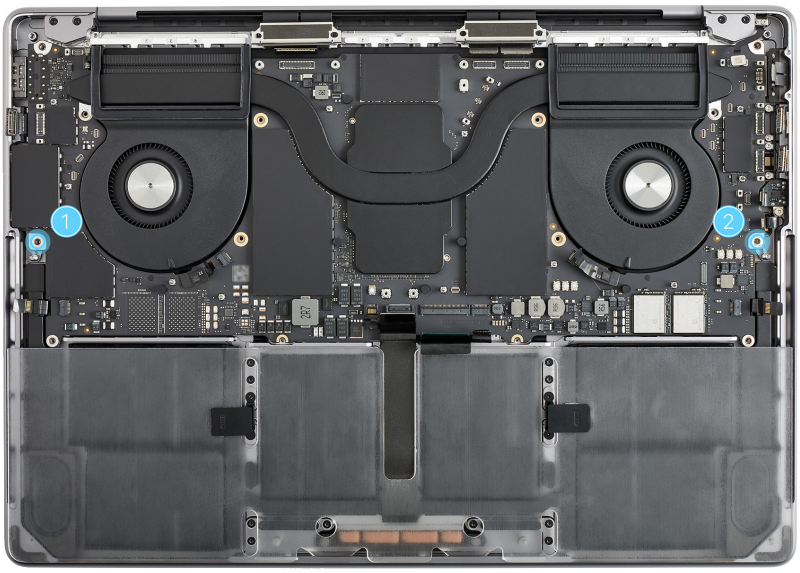


15. Gently remove the Kapton tape from the thermal ducts and flex cables.

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16. Use the T6 screwdriver to partially reinstall one T6 screw (923-07036) (1) into the logic board.

17. Use the T5 screwdriver to partially reinstall one T5 screw (923-07040) (2) into the logic board.



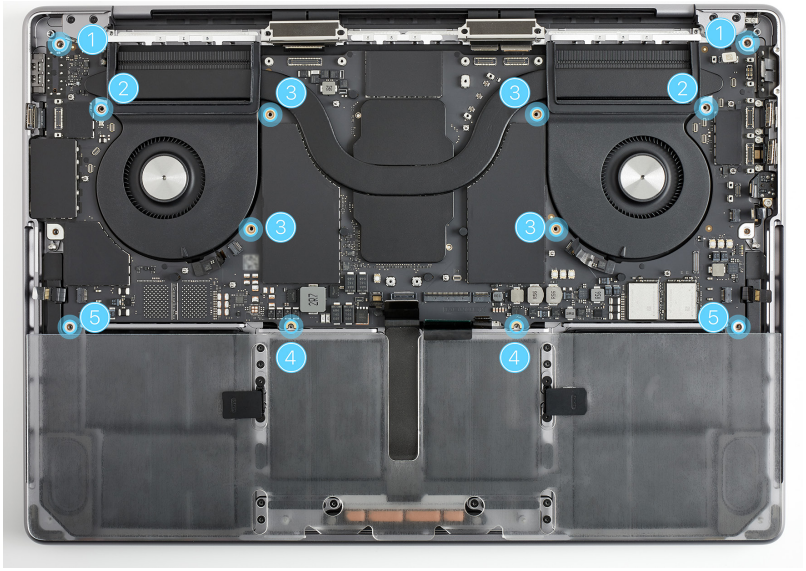
18. Use the T6 screwdriver to partially reinstall the two T6 screws (923-07035) into the logic board (1).

19. Use the T5 screwdriver to partially reinstall the two T5 screws (923-07040) into the logic board (2).

20. Use the T5 screwdriver to partially reinstall the four T5 screws (923-07039) into the logic board (3).

21. Use the T5 screwdriver to partially reinstall the two T5 screws (923-07038) into the logic board (4).

22. Use the T5 screwdriver to partially reinstall the two T5 screws (923-07037) into the logic board (5).

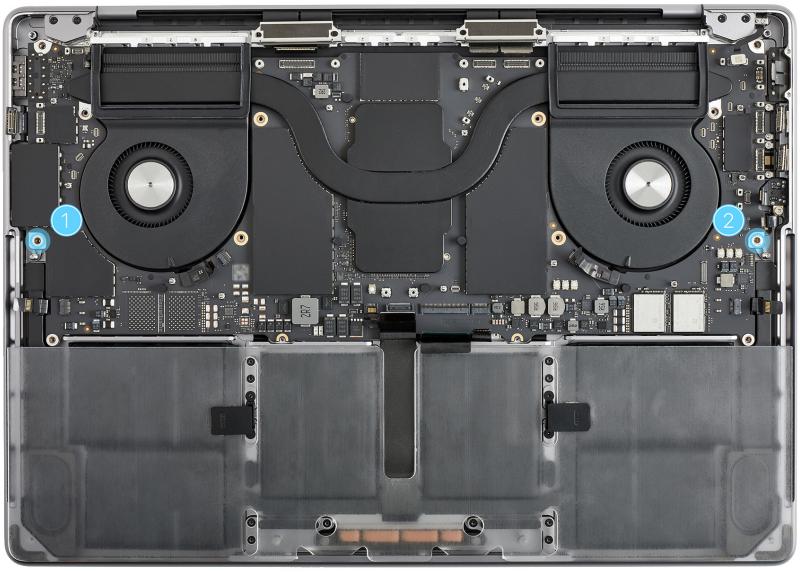


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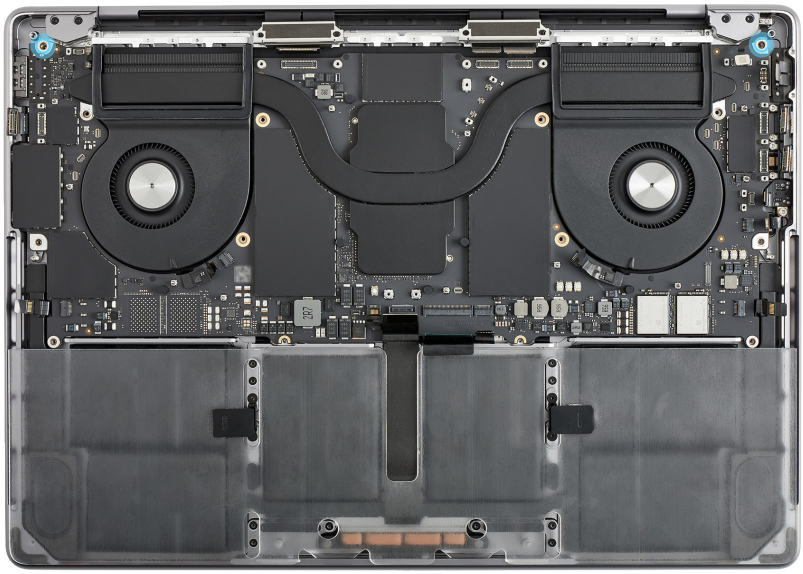
23. Ensure that the logic board sits flush inside the top case.

24. Use the T6 screwdriver to fully reinstall one T6 screw (1).

25. Use the T5 screwdriver to fully reinstall one T5 screw (2).

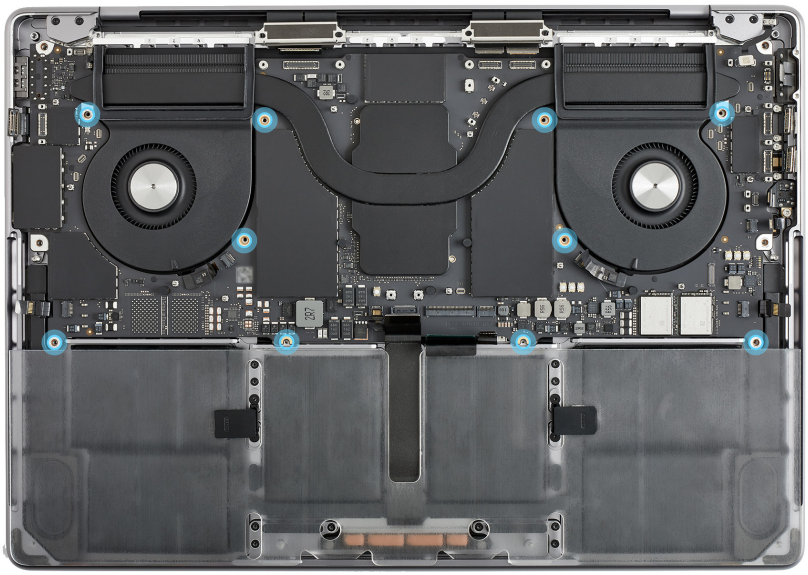


26. Use the T6 screwdriver to fully reinstall the two T6 screws.



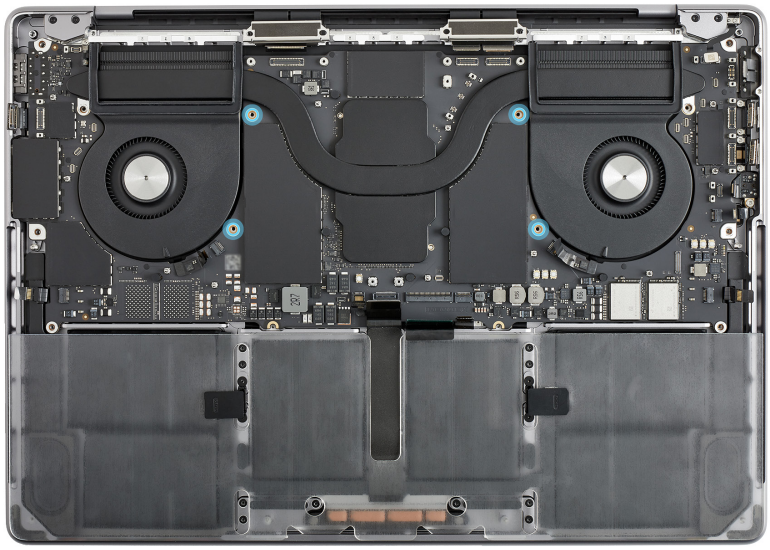
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27. Use the T5 screwdriver to fully reinstall the 10 T5 screws.



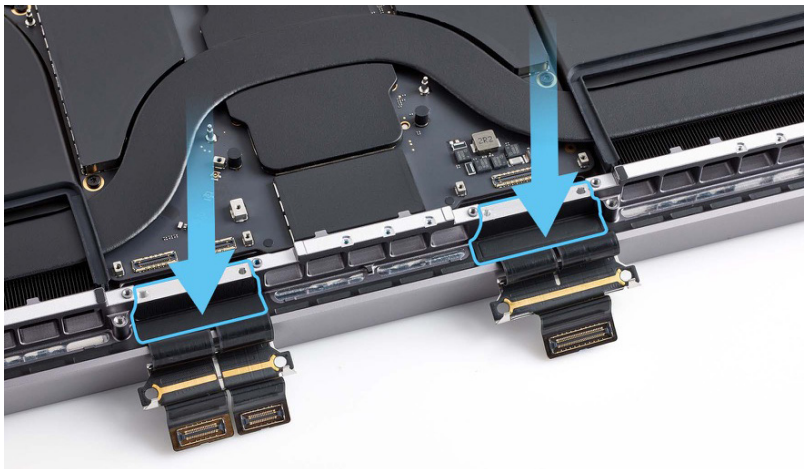
28. Reinstall the four polyester film screw covers.

 Note: Replacement polyester film covers are included with a replacement logic board. If you are reinstalling the existing logic board, you may reinstall the existing polyester film covers.

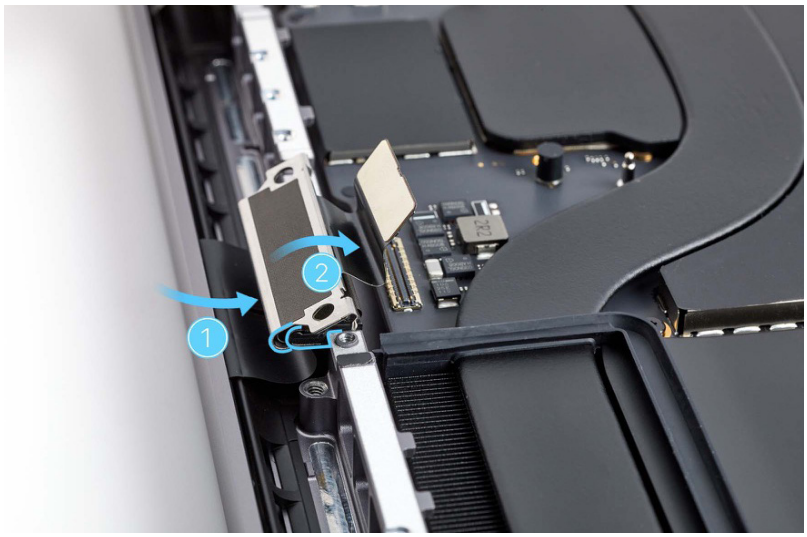


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29. Rotate the top case as shown. Then position the black bumpers on the internal frame.



30. Align the display flex cables around the edge of the bumpers (1). Then press the display cable clips down over the bumpers and onto the internal frame (2).



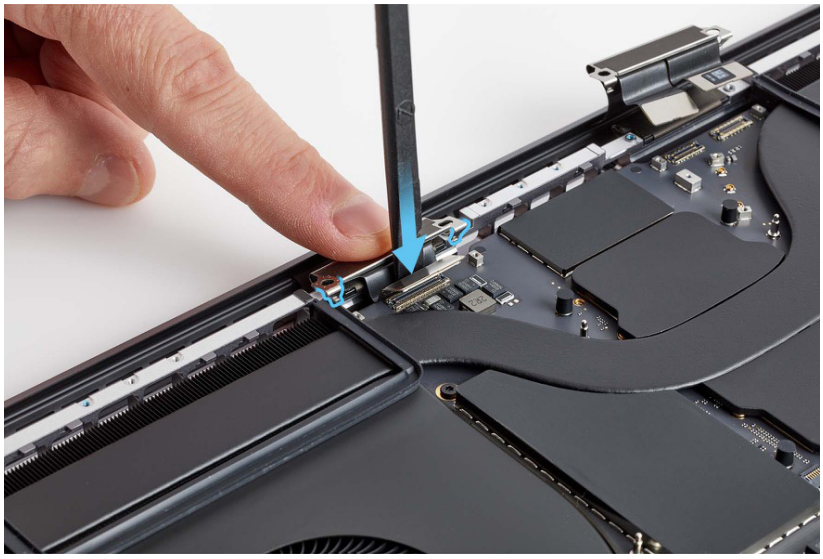
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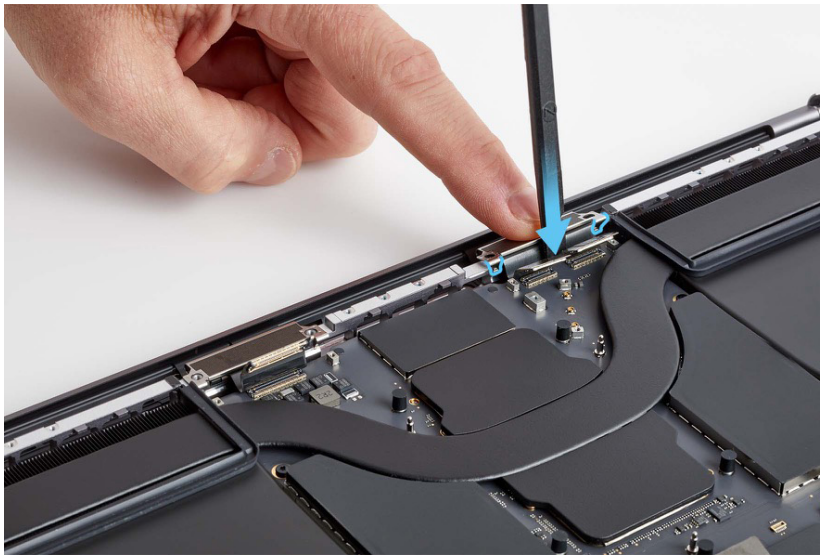
31. Use the black stick to tuck the display flex cables into the gap between the display and internal frame.



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32. Use the black stick to tuck the display flex cables into the gap between the logic board and internal frame. Ensure that the display cable clips are fully clipped onto the internal frame.

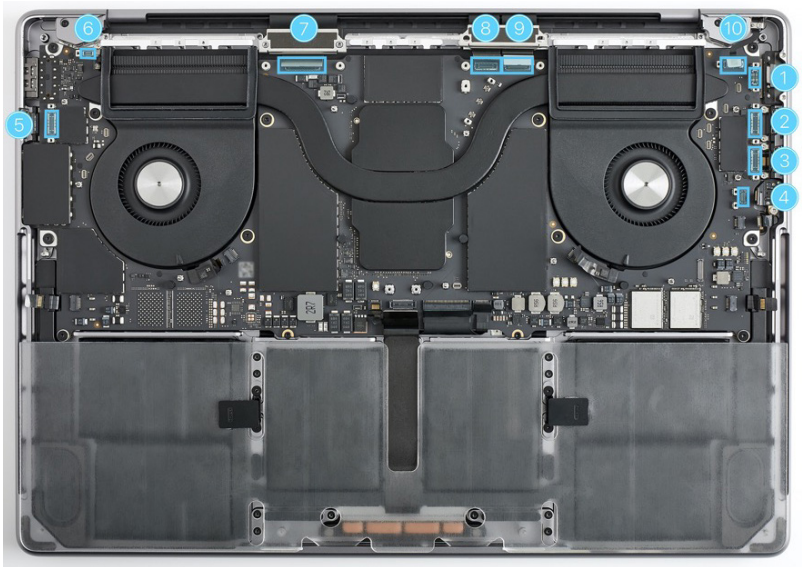




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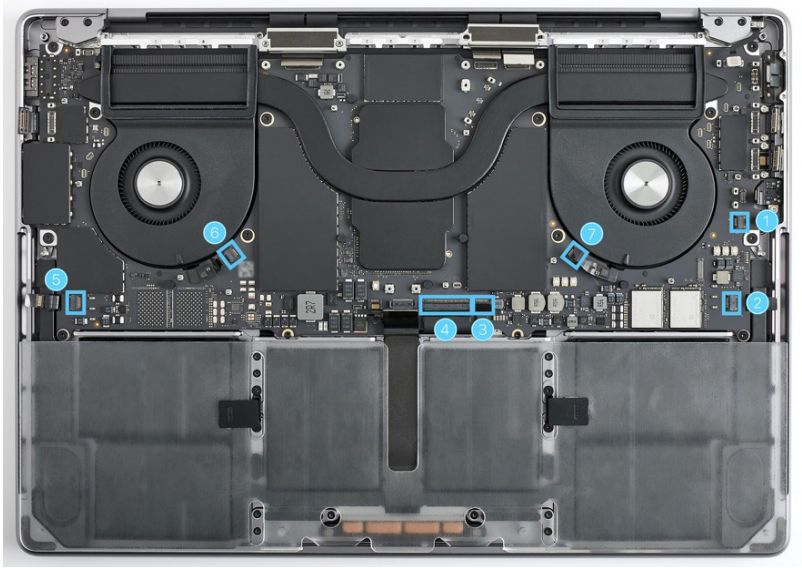
33. Press the ends of the following ten flex cables to the connectors on the logic board:

 - MagSafe power module flex cable (1)
 - Left USB-C flex cables (2, 3)
 - Audio board flex cable (4)
 - Right USB-C flex cable (5)
 - Touch ID board flex cable (6)
 - Display backlight power flex cable (7)
 - FaceTime HD camera flex cable (8)
 - eDP flex cable (9)
 - Lid angle sensor flex cable (10)



34. Slide the ends of the following seven flex cables into the connectors:

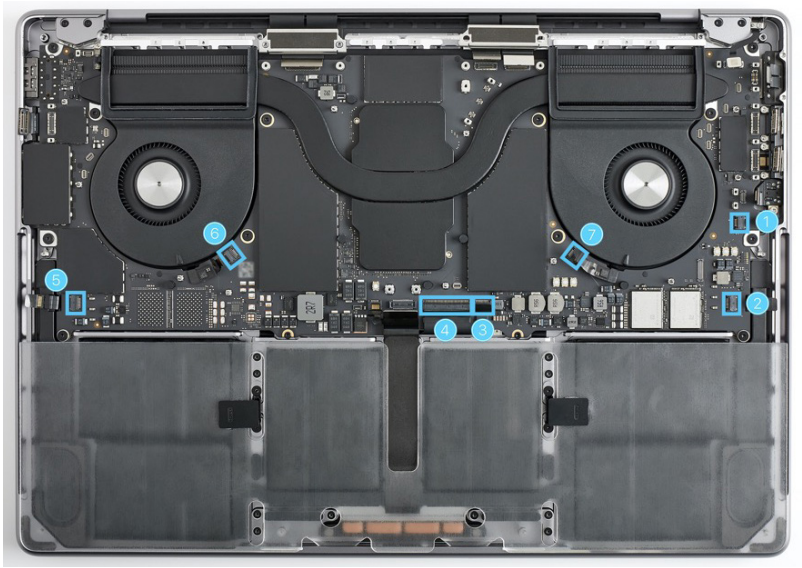
 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)



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35. Use the flat end of the black stick to flip down the locking levers of the following seven flex cables:

 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)

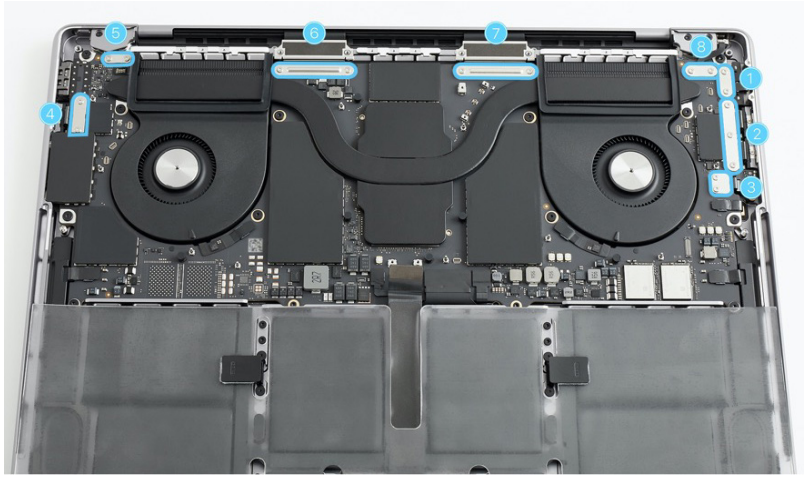


36. Press the polyester film tabs to the ends of the following seven flex cables:

 - Microphone flex cable (1)
 - Left speaker flex cable (2)
 - Keyboard backlight flex cable (3)
 - Keyboard flex cable (4)
 - Right speaker flex cable (5)
 - Right fan flex cable (6)
 - Left fan flex cable (7)

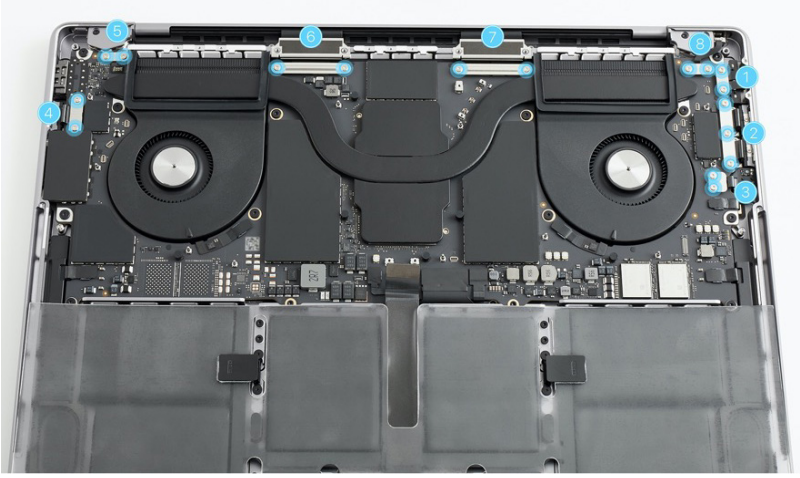
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37. Position the following eight cowlings in the top case:
 - MagSafe 3 board connector cowling (1)
 - Left USB-C boards connector cowling (2)
 - Audio board connector cowling (3)
 - Right USB-C board connector cowling (4)
 - Touch ID board connector cowling (5)
 - Display connector cowling (6)
 - Display connector cowling (7)
 - Lid angle sensor connector cowling (8)



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38. Use the T3 screwdriver to reinstall the following 17 screws into the eight cowlings:



- Two T3 screws (923-06959) into the MagSafe 3 board connector cowling (1)
- Three T3 screws (923-06938) into the left USB-C boards connector cowling (2)
- Two T3 screws (923-06854) into the audio board connector cowling (3)
- Two T3 screws (923-06938) into the right USB-C board connector cowling (4)
- Two T3 screws (923-07046) into the Touch ID board cable cowling (5)
- Two T3 screws (923-06854) into the display connector cowling (6)
- Two T3 screws (923-06854) into the display connector cowling (7)
- Two T3 screws (923-06854) into the lid angle sensor cowling (8)

Reinstall the following part to complete reassembly:

- Vent/antenna
- Bottom case

Important

After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

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Audio Board

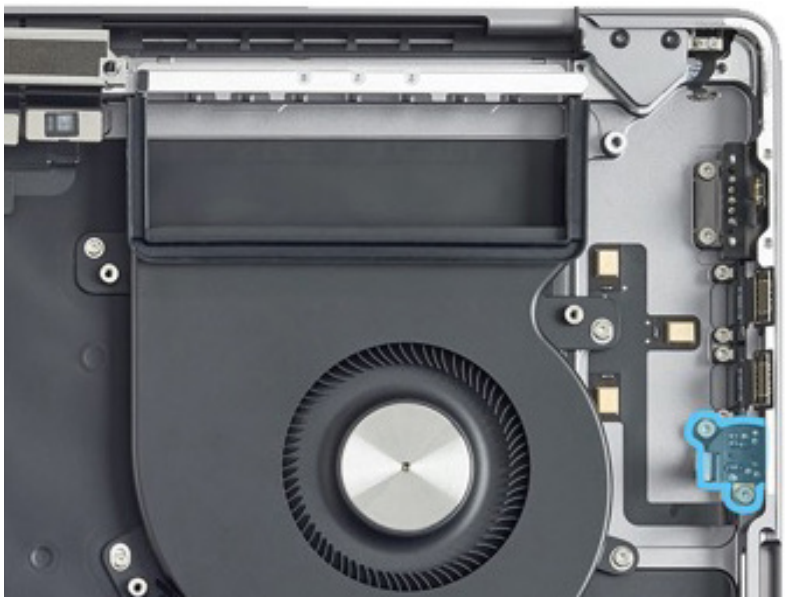
Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Logic board

Tools

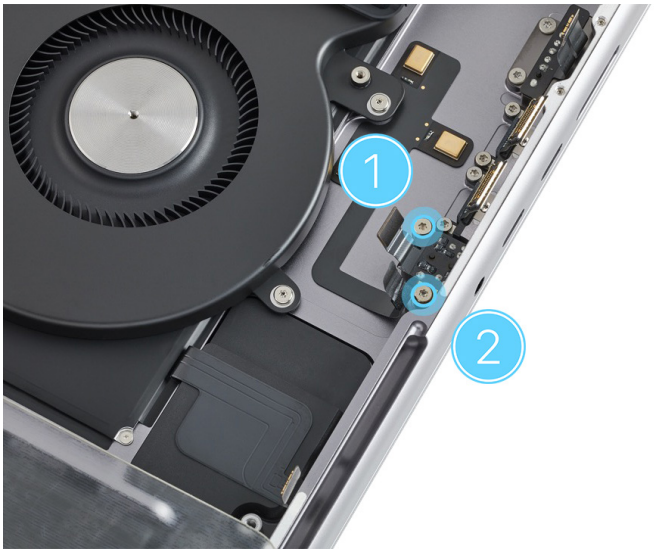
- EarPods with 3.5 mm headphone plug
- Torx T5 screwdriver



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Removal

1. Use the T5 screwdriver to remove the short upper T5 screw (923-06936) (1) and the long lower T5 screw (923-06937) (2) from the audio board.



2. Lift the audio board out of the top case.



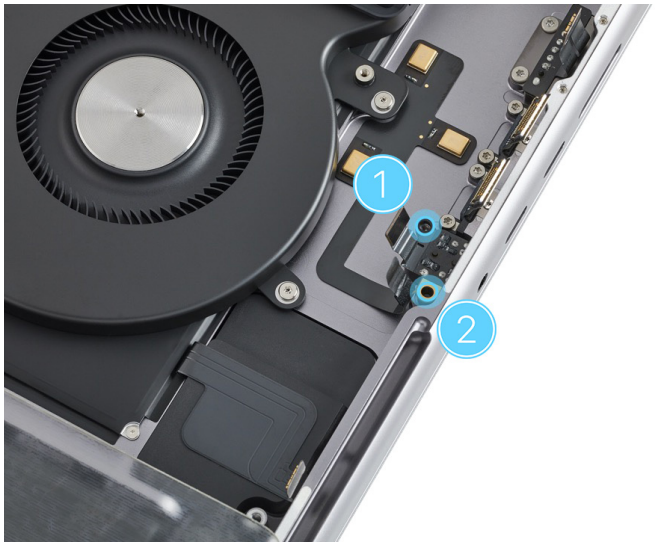
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Reassembly

1. Position the audio board in the top case.



2. Use the T5 screwdriver to partially reinstall the short upper T5 screw (923-06936) (1) and the long lower T5 screw (923-06937) (2) into the audio board.



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3. Plug the EarPods into the 3.5 mm headphone jack to ensure audio board alignment. Adjust the alignment of the audio board until the plug is easy to insert and remove.

4. Use the T5 screwdriver to fully reinstall the T5 screws. Then unplug the EarPods.



Reinstall the following parts to complete reassembly:

- Logic board
- Vent/antenna module
- Bottom case

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Fans

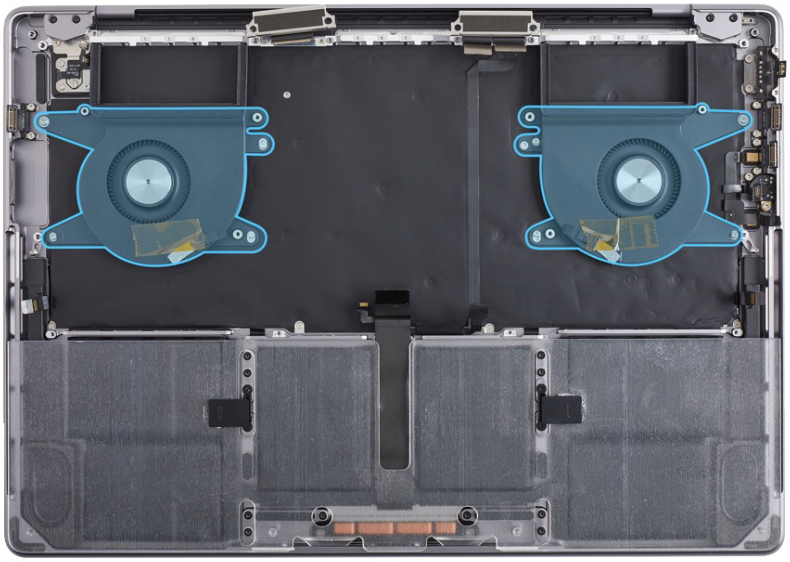
Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Logic board

Tools

- Nylon probe (black stick)
- Torx T3 screwdriver
- Torx T5 screwdriver

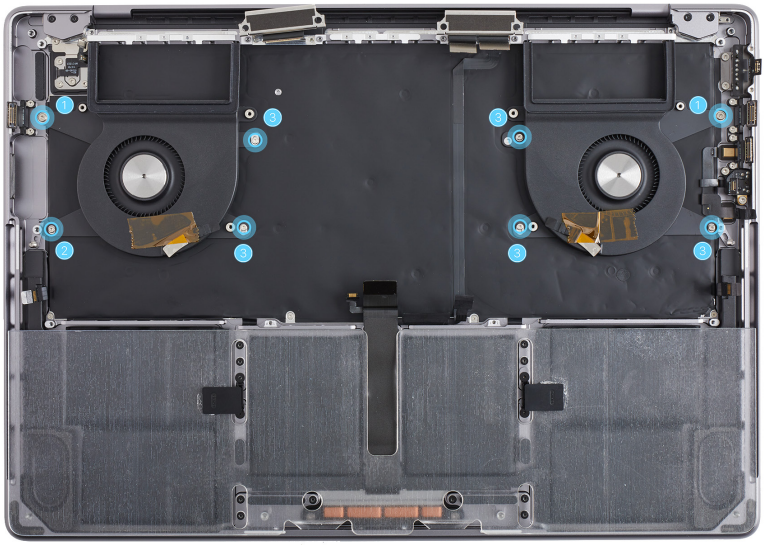


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Removal

1. Use the T5 screwdriver to remove the two T5 screws (923-06929) (1) from the fans.

2. Use the T3 screwdriver to remove one T3 screw (923-06930) (2) from the right fan.



Important

The six T3 screws in the fans may look the same, but they are slightly different.

3. Use the T3 screwdriver to remove the five T3 screws (923-06935) (3) from the fans.

4. Remove the fans from the top case.



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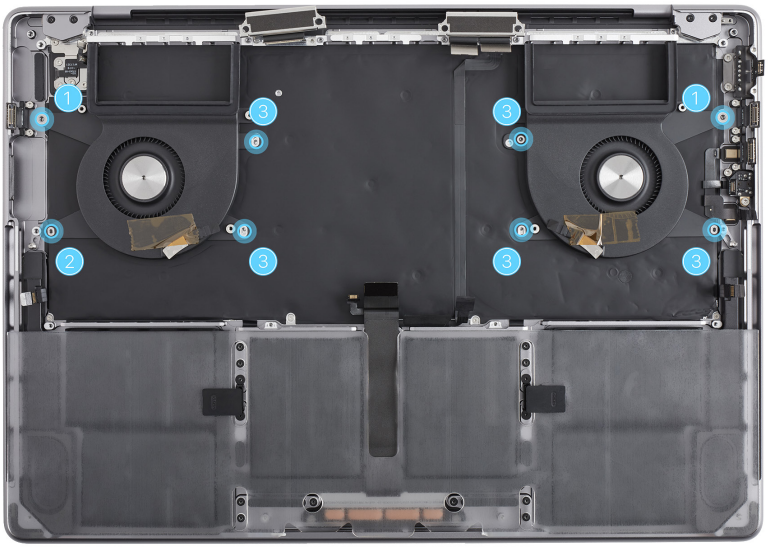
Reassembly

1. Position the fans in the top case.

2. Use the T5 screwdriver to reinstall the two T5 screws (923-06929) (1) into the fans.

3. Use the T3 screwdriver to reinstall one T3 screw (923-06930) (2) into the right fan.

4. Use the T3 screwdriver to reinstall the five T3 screws (923-06935) (3) into the fans.



Reinstall the following parts to complete reassembly:

- Logic board
- Vent/antenna module
- Bottom case

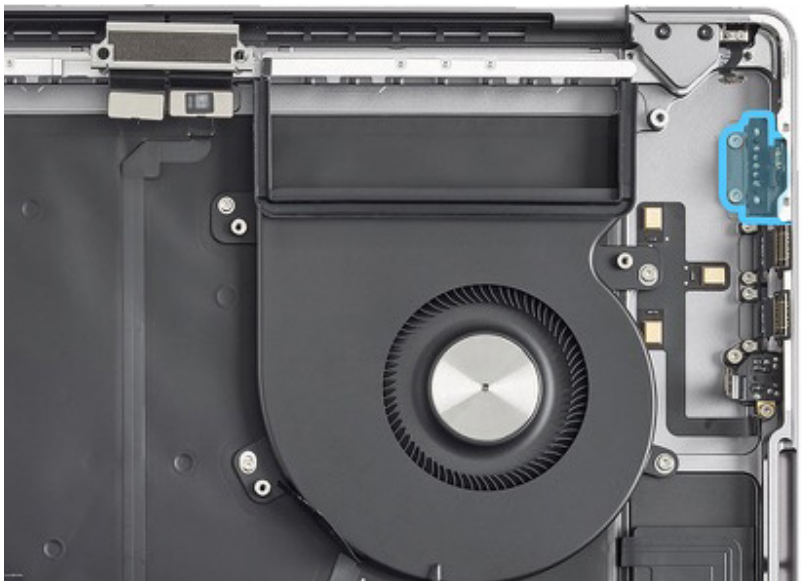
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MagSafe 3 Board

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Logic board



Tools

- Torque driver (blue, 0.65 kgf cm)
- Torx Plus 2IP 44 mm half-moon bit
- Torx T5 screwdriver
- USB-C to MagSafe 3 cable

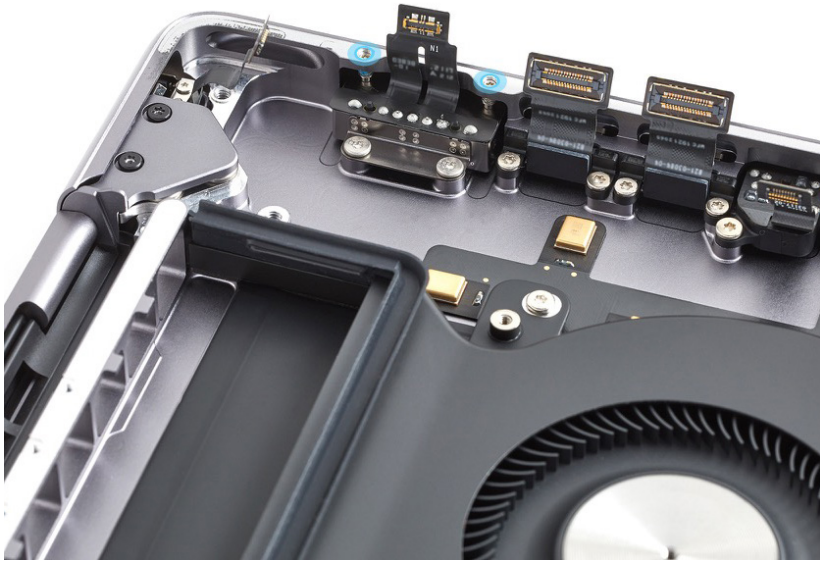
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Removal

1. Use the blue torque driver and the 2IP bit to fully loosen the two 2IP set screws (923-06928) in the top case.

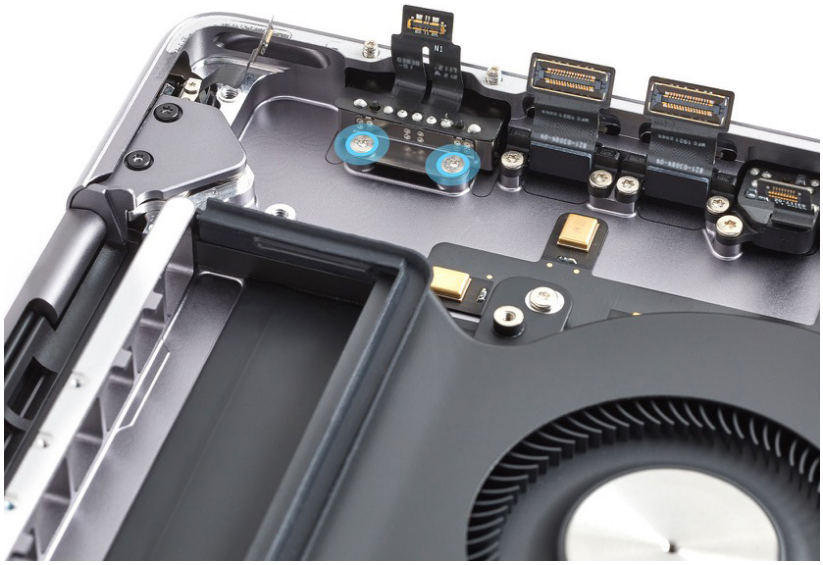
Important

Partially reinstall the set screws if they fall out.



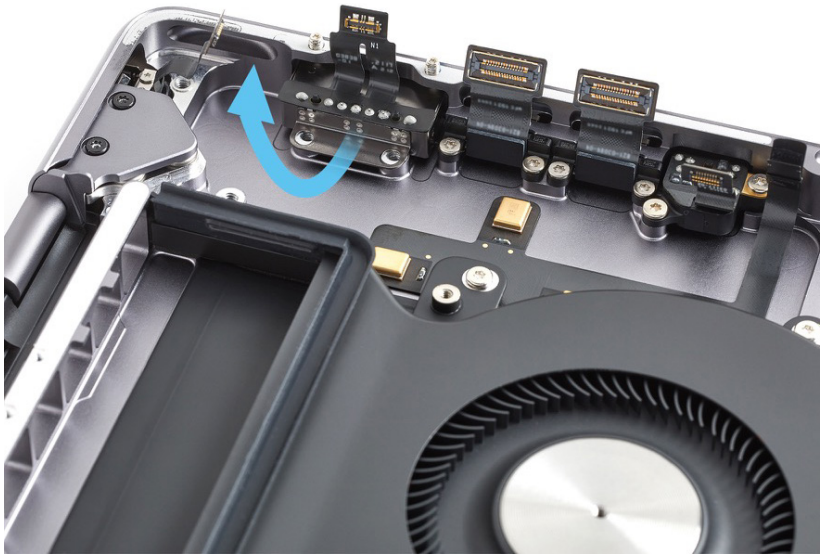
2. Use the T5 screwdriver to remove the two T5 screws (923-06959) from the MagSafe 3 board.

 Note: The screws are non-magnetic.



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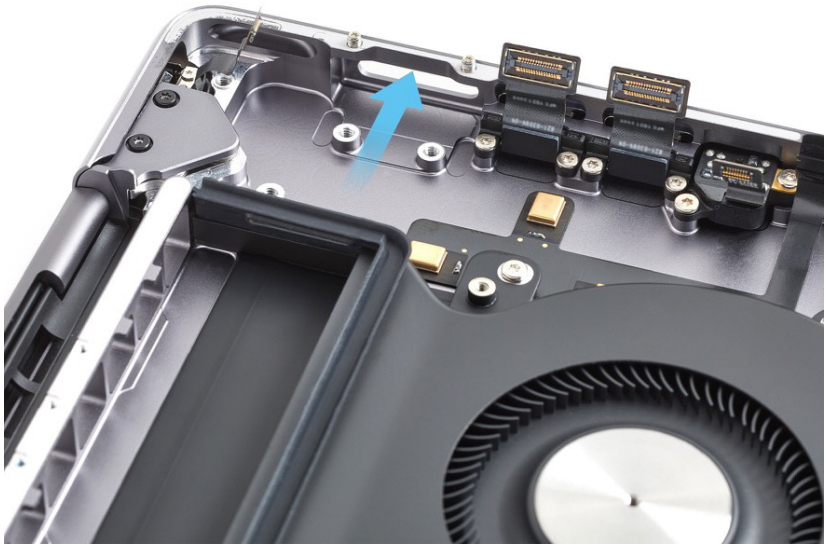
3. Lift the MagSafe 3 board out of the top case.



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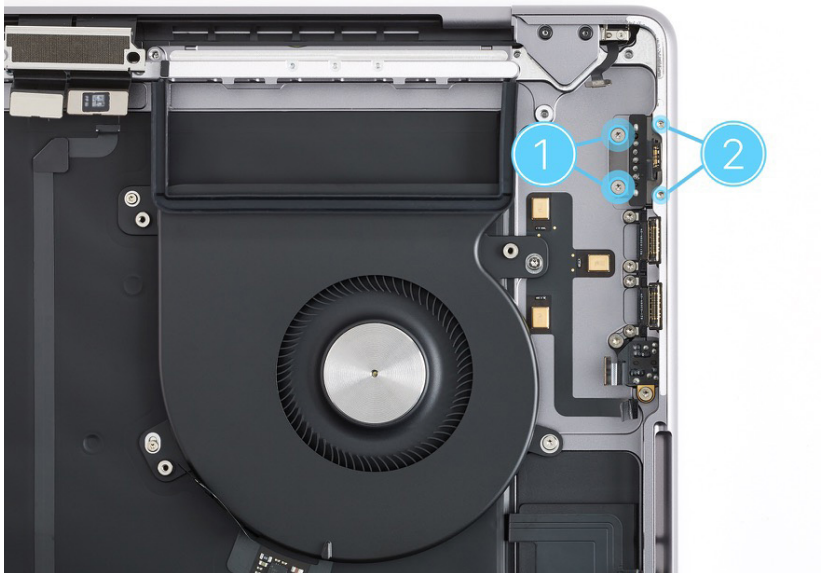
Reassembly

1. Position the MagSafe 3 board in the top case.



2. Use the T5 screwdriver to partially reinstall the two T5 screws (923-06959) (1).

3. Use the blue torque driver and the 2IP bit to partially reinstall the two 2IP set screws (923-06928) (2) into the top case.



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4. Plug the MagSafe 3 end of the USB-C to MagSafe 3 cable into the MagSafe 3 port to ensure MagSafe 3 board alignment. Use the flat end of the black stick to hold the MagSafe 3 board in place to create an even gap between the MagSafe 3 connector and top case.

Danger

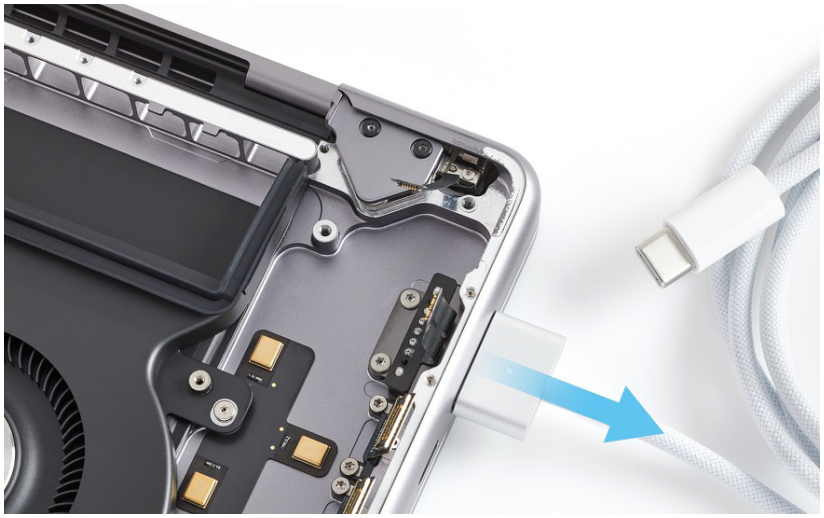
Ensure that the USB-C to MagSafe 3 cable isn't plugged into power.

5. Use the T5 screwdriver to fully reinstall the two T5 screws (1).

6. Use the blue torque driver and the 2IP bit to fully reinstall the two 2IP set screws (2).



7. Unplug the USB-C to MagSafe 3 cable from the MagSafe 3 port.



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Reinstall the following parts to complete reassembly:

- Logic board
- Vent/antenna module
- Bottom case

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Touch ID Board

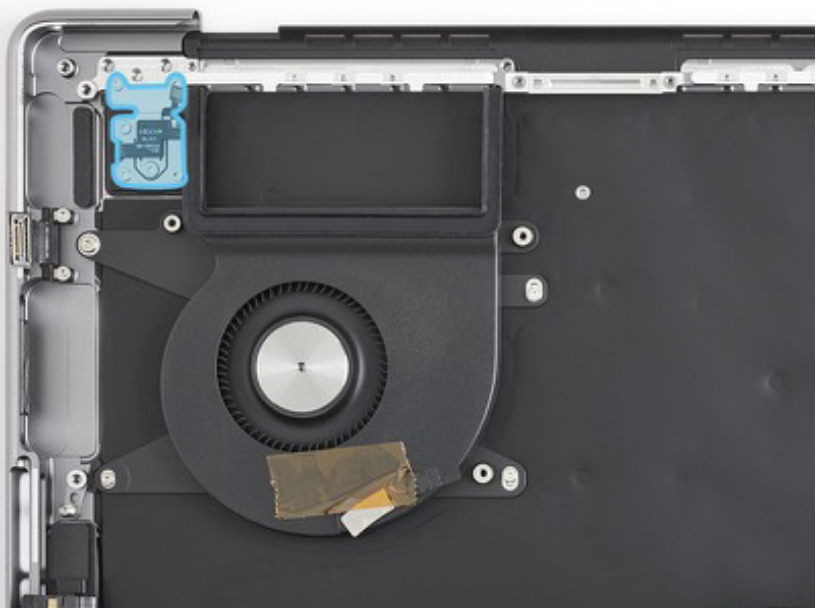
Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Logic board
- Display hinge covers
- Display

Tools

- ESD-safe tweezers
- Kapton tape
- Nylon probe (black stick)
- Torx T3 screwdriver
- Touch ID alignment kit



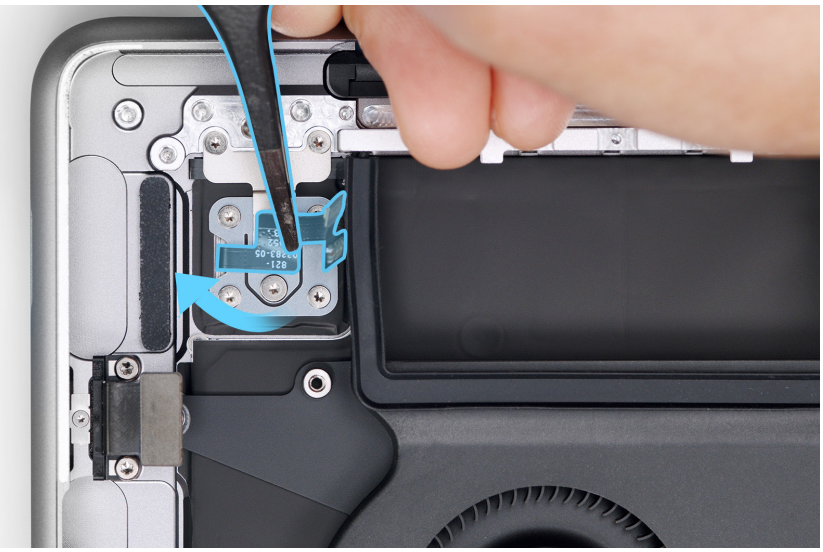
Important

- This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.
- This procedure may require a Touch ID board shim kit, which only comes with a replacement Touch ID board. It's not a separate orderable part.

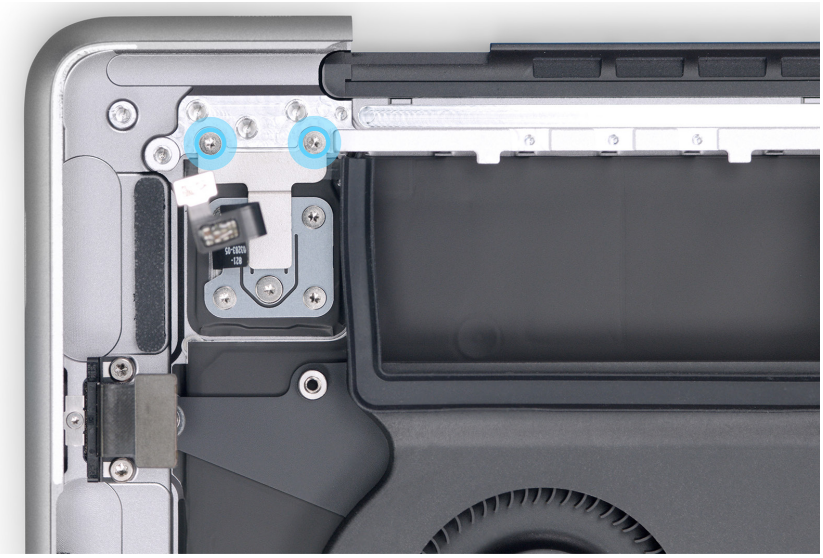
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Removal

1. Use ESD-safe tweezers to loosen the adhesive on the Touch ID board flex cable. Fold the flex cable back from the Y-shaped cowling to expose the Touch ID board flexible cowling.

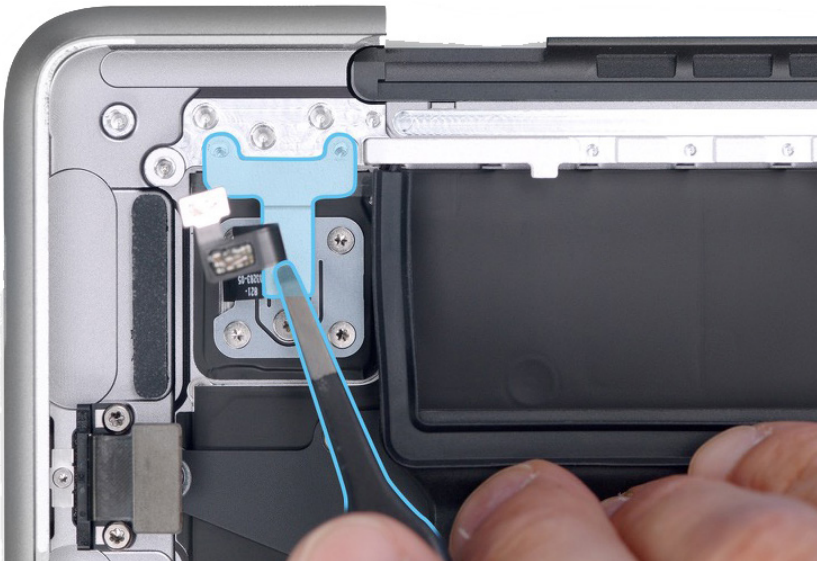


2. Use the T3 screwdriver to remove the two T3 screws (923-06940) from the Y-shaped cowling.

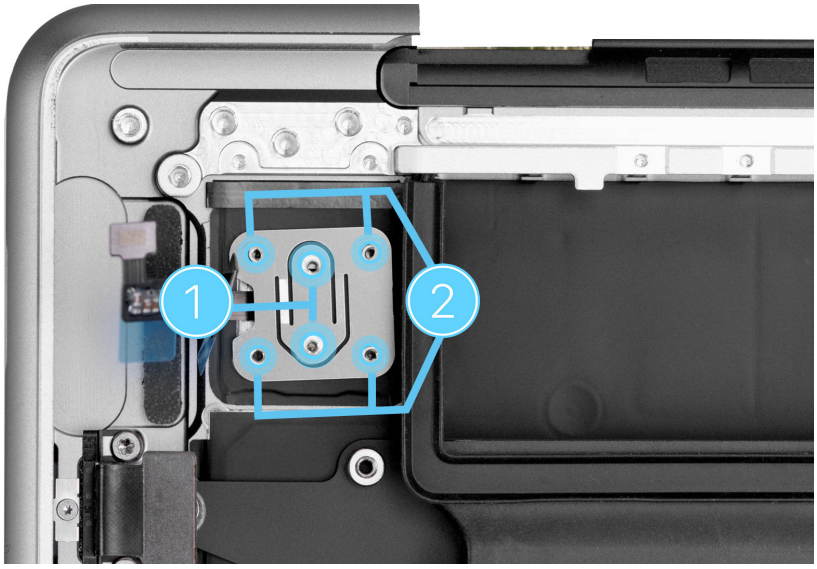


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3. Use ESD-safe tweezers to remove the Y-shaped cowling from the top case. Save the cowling for reassembly.

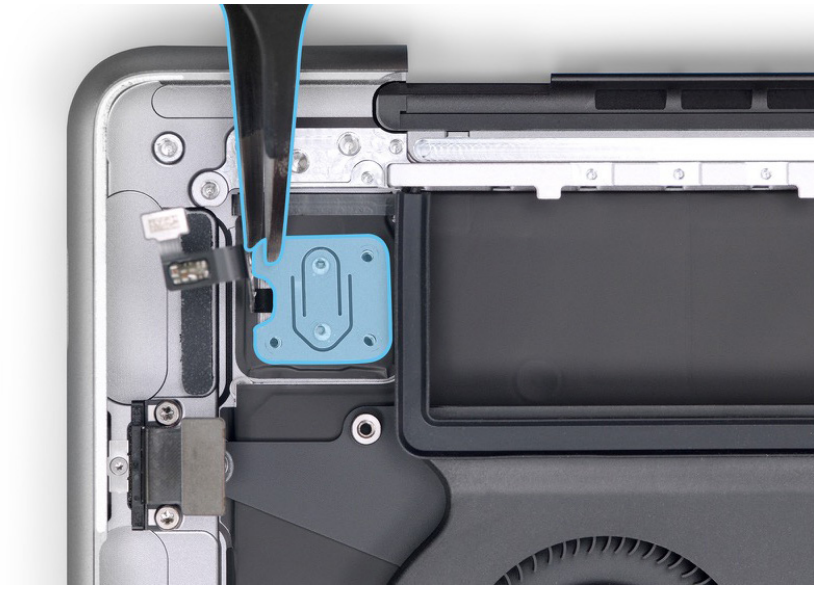


4. Use the T3 screwdriver to remove the two short T3 screws (923-06942) (1) from the Touch ID board flexible cowling. Then use the T3 screwdriver to remove the four long T3 screws (923-06942) (2) from the Touch ID board flexible cowling.



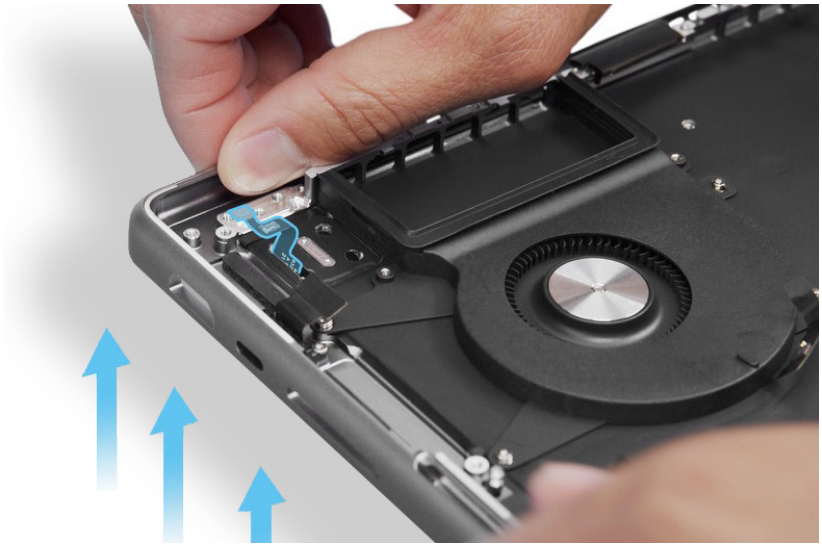
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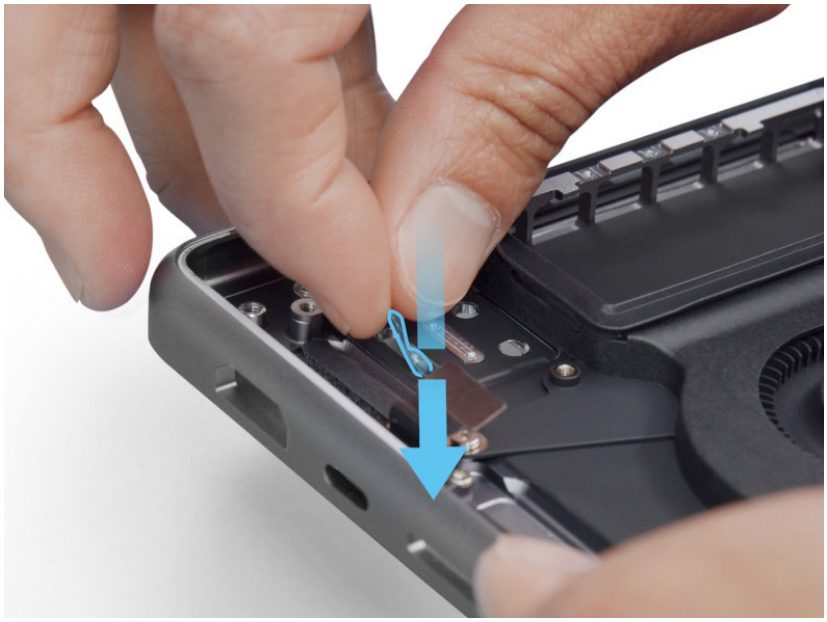
5. Use ESD-safe tweezers to remove the Touch ID board flexible cowling from the top case. Save the flexible cowling for reassembly.



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6. Tilt up the corner of the top case as shown. Then guide the Touch ID board flex cable out through the slot in the top case to remove the Touch ID board.





Important

- If the Touch ID board wasn't clicking properly before removal, continue to removal step 7 to remove the Touch ID shim.
- Ensure that your work surface is clean. Under the Touch ID board is the Touch ID shim, which is a small circular part. If it falls, you can more easily find it on a clean surface.
- If you're using the existing Touch ID shim, skip to reassembly step 1.

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7. Place the computer right side up. Spread the tips of the pointed ESD-safe tweezers and use one tip to remove the shim from the circular recess under the Touch ID board.

 Note: The shim has a small amount of adhesive and may stick to the top case.



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Reassembly

Important

If you are replacing the Touch ID shim, follow reassembly steps 2 through 5. If you're using the existing shim, skip to reassembly step 6.

1. Place the computer right side up.

Caution

Ensure that you place the computer on a clean surface to avoid damaging internal parts.

2. Use the pointed ESD-safe tweezers to pick up the medium Touch ID shim from the shim kit.

 Note: The shim is black on the adhesive side and silver on the opposite side

3. Align the Touch ID shim in the recessed circle in the top case with the adhesive side down.



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4. Press the Touch ID shim to adhere it to the top case.



5. Stand the top case on its side as shown.

6. Route the Touch ID board flex cable through the slot to position the Touch ID board in the top case.

Important

If you're installing a replacement Touch ID board, don't remove the blue protective liners yet.



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7. Place the top case right side up.

> **Caution**
>
> Ensure that the Touch ID board flex cable is tucked under the top case to avoid pinching the flex cable.



8. Remove the blue protective liner on the Touch ID button.



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9. Set two Y-shaped alignment tools against the Touch ID button as shown. Secure the Y-shaped tools with Kapton tape.

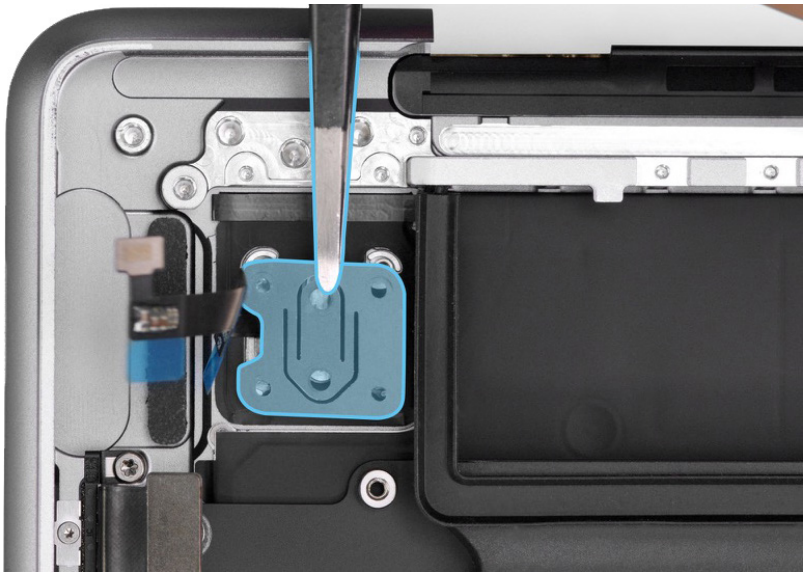


10. Place the top case upside down.

11. Use ESD-safe tweezers to position the Touch ID board flexible cowling as shown.

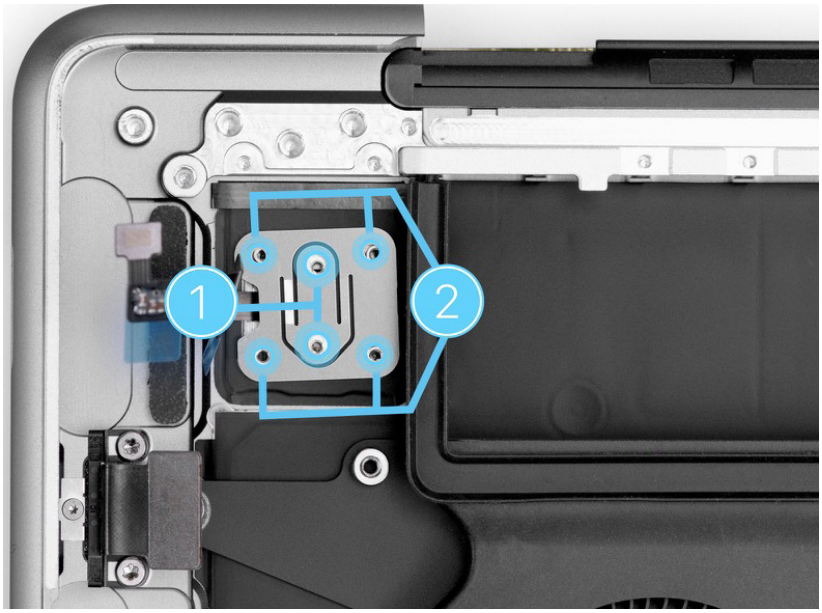
Important

Ensure that the Touch ID board flexible cowling is installed right side up.

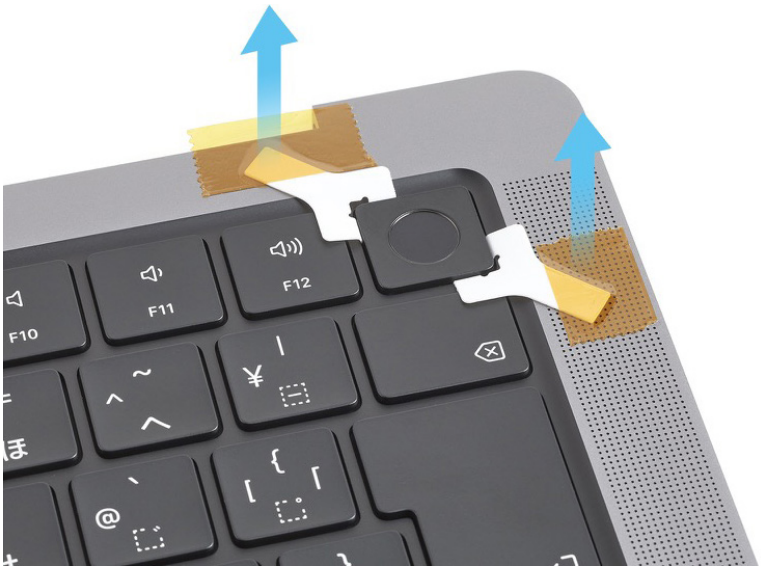


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12. Use the T3 screwdriver to partially reinstall the two center T3 screws (923-06942) (1). Then use the T3 screwdriver to reinstall the four outer T3 screws (923-06955) (2).



13. Place the computer right side up and remove the alignment tools.



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14. Press the Touch ID button to ensure that you can feel it click.



15. Turn the top case upside down. Use the T3 screwdriver to fully tighten the two center screws. Then ensure that the Touch ID button still clicks when pressed.

Important

- If the Touch ID button feels too loose, repeat removal steps 4 through 7. Then repeat reassembly steps 2 through 13 with a larger Touch ID shim.
- If the Touch ID button feels too stiff or doesn't click, repeat removal steps 4 through 7. Then repeat reassembly steps 2 through 13 with a smaller Touch ID shim.

16. Turn the top case right side up.

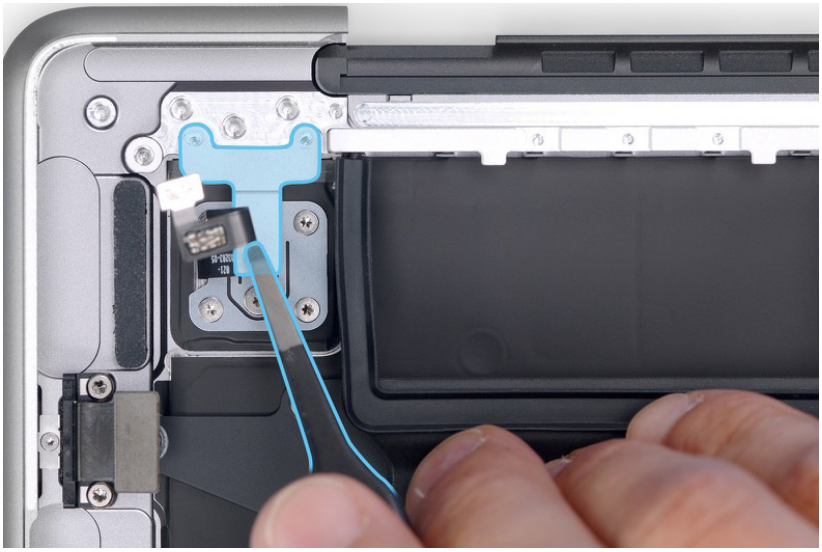
17. Look directly over the Touch ID sensor. The spaces on each side should appear equal, and the Touch ID sensor should align with the function keys. If the gaps around the sides are unequal, repeat reassembly steps 11 through 14.



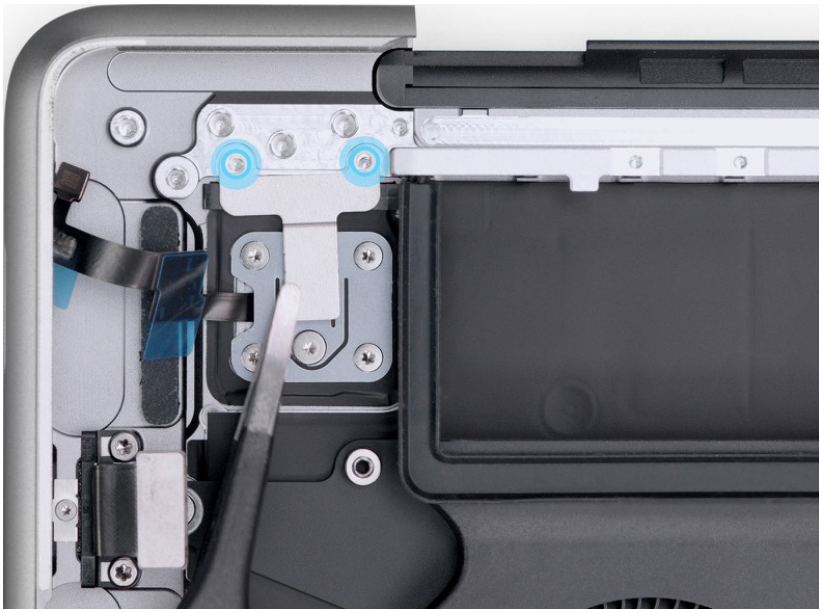
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18. Turn the top case upside down.

19. Use the ESD-safe tweezers to position the Y-shaped cowling in the top case.



20. Use the T3 screwdriver to reinstall the two T3 screws (923-06940) into the Y-shaped cowling.



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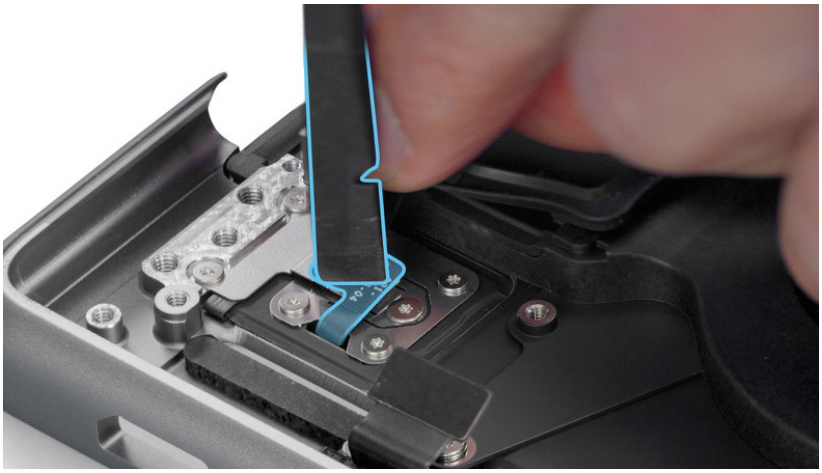
21. If you're installing a replacement Touch ID board, remove the blue protective liner under the Touch ID board flex cable.



Important

Leave the other blue protective lining on the end of the Touch ID board flex cable until you have reinstalled the logic board.

22. Gently run the flat end of the black stick along the length of the Touch ID board flex cable to adhere it to the Y-shaped cowling.



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Reinstall the following parts to complete reassembly:

- Display
- Display hinge covers
- Logic board
- Vent/antenna module
- Bottom case

Important

After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

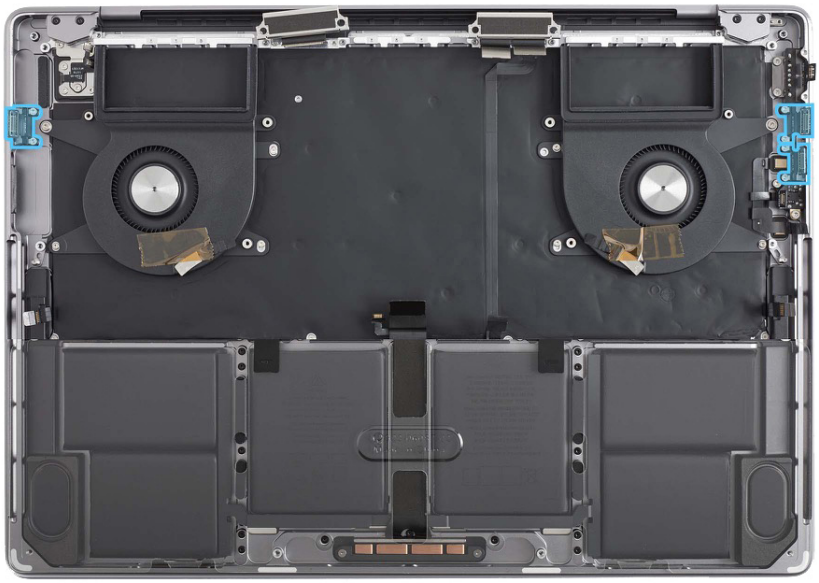
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USB-C Boards

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Vent/antenna module
- Logic board



Tools

- ESD-safe tweezers
- Torx T5 screwdriver
- USB-C charge cable

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Removal

Note: The images in this procedure show the removal and reinstallation of only one USB-C board. However, the procedure is the same for all three USB-C boards.

1. Use the T5 screwdriver to remove the two T5 screws (923-06938) from the USB-C board.



2. Slide the USB-C board out of the top case.



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Reassembly

1. Use ESD-safe tweezers to position the USB-C board in the top case.



2. Use the T5 screwdriver to partially reinstall the two T5 screws (923-06938).



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3. Plug one end of the USB-C charge cable into the port to ensure USB-C board alignment. Adjust the alignment of the USB-C board until the end of the cable is easy to insert and remove.

Danger

Ensure that the USB-C charge cable isn't plugged into power.

4. Use the T5 screwdriver to fully tighten the two T5 screws with the charge cable still in the port.



5. Unplug the USB-C charge cable from the port.

Reinstall the following parts to complete reassembly:

- Logic board
- Vent/antenna module
- Bottom case

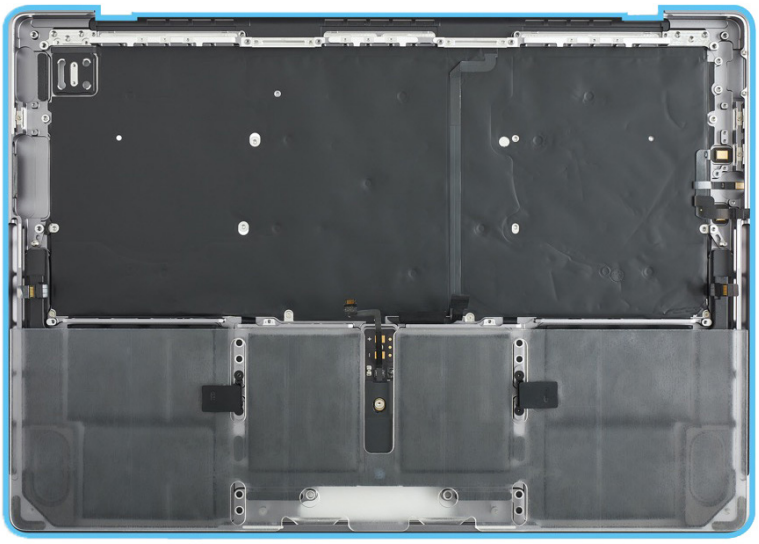
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Top Case with Battery and Keyboard

Before You Begin

Remove the following parts before you begin:

- Bottom case
- Battery management unit flex cable
- Lid angle sensor
- Trackpad and trackpad flex cable
- Vent/antenna module
- Logic board
- Display hinge covers
- Display
- Audio board
- Fans
- MagSafe 3 board
- USB-C boards
- Touch ID board



Tools

- No tools are required for this procedure.

Important

This procedure requires System Configuration. After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

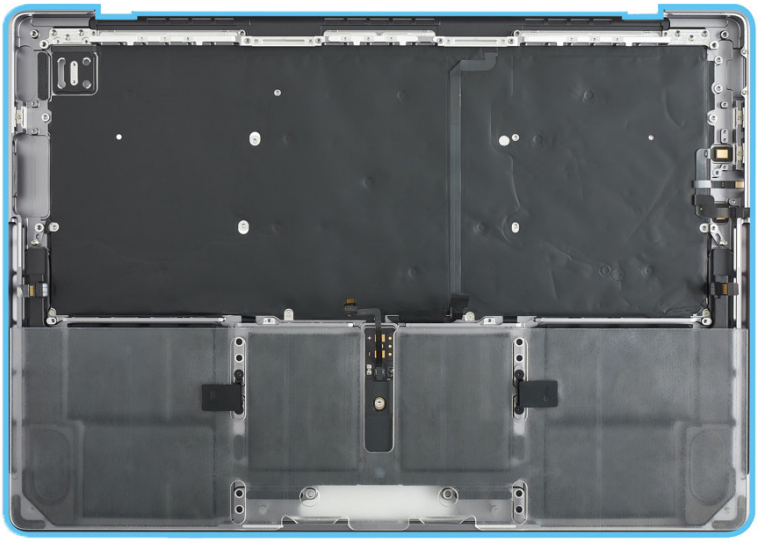
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Removal

Warning

The battery is part of the top case. Don’t attempt to remove the battery from the top case.

1. There are no additional removal steps. The top case includes the following nonremovable parts:
 - Battery and BMU board
 - Keyboard and keyboard flex cable
 - Microphone
 - Speakers



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Reassembly

Reinstall the following parts to complete reassembly:

- Touch ID board
- USB-C boards
- MagSafe 3 board
- Fans
- Audio board
- Display
- Display hinge covers
- Logic board
- Vent/antenna module
- Trackpad and trackpad flex cable
- Lid angle sensor
- Battery management unit flex cable
- Bottom case

Important

After you've completed all removal and reassembly steps, learn how to initiate the System Configuration process at support.apple.com/self-service-repair.

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